THE RAILWAY REVIEW

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Quality of Material in Rockefeller's Ship. — The following notes taken from the specifications of the steamers that are being built by the Globe Iron Works Company, Cleveland, Ohio, for Mr. John D. Rockefeller, will indicate the care that is being taken to make them first-class in every respect; "All plating to be of open hearth mild steel, tested to the following specifications: Tensile strength to be not less than 54,000 not more than 62,000 lbs. per square inch. Limit of phosphorous not to exceed .08; elongation to be not less than 24 per cent in eight inches and radiation to be not less than 45 per cent. Reports of tests are to be furnished with invoices, and plates are not to be run over or under theoretical weight more than 2½ per cent. All plates are to be of open hearth steel. All shapes that are furnace shaped are also to be of open hearth steel. All other shapes can be of Bessemer steel or open hearth steel as desired by the builder. Rivets are to be of the best open hearth steel, the limit of phosphorus to be .06, limit of sulphur .06 and tensile strength to be not less than 52,000 or more than 60,000 lbs. per square inch; or, at the option of the builders, to be of the first-class quality of iron rivet material, of not less than 50,000 tensile strength per square inch. Materials are to be tested at makers' works to these requirements by a disinterested party to represent both steel maker and ship builder, and to be appointed by the ship builder; provided that in case of angles, channels, beams and Z bars, the certified reports of tests made at the laboratory of the Pencoyd Iron Works will be accepted by the owner."

Exporting Redwood from California.—The first cargo of California redwood was recently sent to England. It is a strange thing that no one ever attempted this before, and the San Francisco News Letter prophesy good returns to any firm making a regular trade of it. The redwood is beautifully adapted for interior finishings, and would soon become a favorite with the wealthy class in England. We would suggest that if the cargoes be repeated only the finer qualities of wood and those with handsome markings be sent across. By so doing there will soon arise a large demand for the poorer woods as well, and a large trade will be built up. The people in London who will wish to finish their residences with our redwood will not worry much over the price they may have to pay for it. They will get a superior article, and one which in point of beauty and durability will compare favorably with oak, mahogany, or ash. The redwood is capable of taking a polish superior to any of these woods, and will prove just thing for the interior of a handsome English residence. Here is an opportunity for lumber men and others to get in and work up a good and remunerative business, and we trust they will not let the opportunity go by. We have a cinch on the redwoods, and with a little enterprise can furnish all Europe with timber, the like of which the world cannot produce elsewhere.

The Mitis Process.—In the melting of wrought iron it is necessary to heat it to a much higher temperature than is usually obtained in the cupola, in order to reach the fluidity necessary to secure a clean, sharp casting, and the resultant castings are of very inferior quality. There is, however, a process of making wrought iron castings, known as the "Mitis" process, which is substantially as follows: The charge of wrought iron is heated to a temperature of 2,200 deg. Cen., at which heat it assumes a pasty condition, when from .03 to .05 per cent of aluminum is introduced in the shape of ferro-aluminum (6 per cent aluminum). The metal at once becomes fluid, and will produce good sharp castings, retaining all of the characteristics of wrought iron, except the fibre. Cast iron and steel borings and turnings may be melted in the cupola, in the proportion of 10 to 15 per cent with high silicon pig, and will make good strong castings, but it would not be advisable to attempt to melt wrought iron turnings in a cupola.—[Engineer, London.

Large Engine Mileage.—The Pennsylvania and Pan Handle Railroads are reported as having an interesting contest to see which can show an engine with the greatest record for mileage without being shopped. Class P engine No. 110, of the Pan Handle, which hauls the fast mail west and first No. 6 east, two of the hardest runs west of Pittsburgh, has almost passed the 200,000-mile record, and is still in good condition, so that, if nothing happens, she [illegible]ntinue to make 186 miles a day for three or four [illegible]t the least, so that by the time she has to be [illegible]she will have a great record. The Pennsylvania [illegible]her class P engine that has passed the 190,000-[illegible]rk without having to be shopped, and if no accidents occur it will probably keep close to the figures which represent the mileage of the 110. Such records not only indicate perfect machinery, but they are likewise an indication of careful and conscientious work on the part of the engineers and firemen as well.

Aluminum in Iron Castings.—It has been found that the presence of a small quantity of aluminum in ordinary cast iron strengthens the material considerably. Its action is not clearly understood, but it is probable that the presence of this metal prevents blow holes by decomposing carbonic oxide at high temperatures. The gas which forms ordinary blow holes is supposed to be caused by the dispossession of graphite carbon which causes the carbon in the iron to become of the nature of graphite, instead of being combined in the proper manner. A very good idea of iron in this condition may be obtained by inspecting a piece of cast iron which has been immersed in salt water for a considerable time. The propeller wheel of a steamboat offers an excellent example; the iron will be soft and porous and readily cut with a knife. The addition of a small quantity of aluminum to the melted iron prevents separation of the carbon as noted above, therefore it prevents the formation of a gas and its consequent blow holes.

A Sea Water Supply for London.—This subject is again under discussion. A bill permitting the introduction of such a supply passed parliament some time ago, but was never made use of, the present promoters urging that they found the proposed capitalization and supply too small when they canvassed for subscribers. The old scheme was for a daily supply of about 1,500,000 U. S. gallons, while the present plans are for 12,000,000 U. S. gallons. It is proposed to lay an intake at Lancing, between Brighton and Worthing. This intake would terminate in a pump well from which water would be lifted to a 12,000,000 gallon settling reservoir, with its bottom about 10 ft. ft. below high water. From this reservoir the water would be pumped to another one of 12,000,000 gallons capacity, 500 ft. above the sea, from which it would flow by gravity to still another of the same size at Epsom, 200 ft. above the sea. The intake would be 36 in. in diameter and the pumping and gravity mains would range, it appears, from 36 to 30 in. in diameter. The promoters hope to supply some smaller municipalities besides London, and count on a demand for salt water for a great variety of public and private purposes, even boasting that they can furnish it cheaper for street sprinkling than the present local companies can pump it from the Thames. It is stated in this connection that the first English town to use sea water was Ryde, more than 40 years ago; that the next was Tynemouth, in 1872; and that since then it has been introduced in 18 enumerated places, besides some others. All these towns, it is implied, are on the sea coast. The above information is extracted from a paper by Mr. Frank W. Grierson, read before the Society of Arts on January 22, 1896, and published in the London "Architect" for January 31.

A Remarkable Bridge.—The new bridge to be erected over the Tennessee river, at Knoxville, while not to be of unusual size, will be, the engineer in charge says, a wonder in the engineering and architectural world. It is to be built entirely of pink marble, quarried in Knox county and within a few miles of the site. It will be 1,600 ft. long from "out to out" of abutments, and will be 240 ft. long in the main spans of arch, which, it is claimed, is 20 ft. longer than the longest arch in the world. It will rise at the crown of the channel spans 105 ft. above the water, making it a decidedly imposing structure. It is to be a solid marble bridge from side to side, with a 50 ft. roadway 100 ft. above water, with the four largest spans in the over world. The immense arches will be 8 ft. deep at the keystone, 15 ft. at the skewbacks or spring lines, and will spring from piers 30 ft. high and 40 ft. wide. The piers go to solid rock, the substructure limestone, 12 ft. below the water surface at the bridge site. The arches and spandrel filling will be constructed of concrete. The parapet walls will be constructed of sawed marble slabs, with heavy blocks on pilasters every 15 ft., projecting above the wall proper and giving what might be called a semi-castellated effect.

Only a Matter of Detail.—A well known manufacturing house recently turned out an article for which they expected an extensive sale. The experiments showed that the design was all that could be desired, and a careful examination suggested no improvements; but when the apparatus was built and put into the hard service for which it was intended it refused to work. In short there was a steam chamber and in it a sleeve worked to and fro over an arbor. The fit was an easy one and the slightest push of the band would do the work; but—and this "but" is of great importance—the sleeve was of cast iron and the arbor of brass. So when the temperature of the two was raised by the steam, the unequal expansion of the two caused the brass to fill the sleeve and grip it so firmly that it could not be budged. Merely a matter of the selection of materials; nothing more than a question of clearance; a trifling detail, and on it depended the successful working of the machine. Is it any wonder when we have matter of this sort thrust in our face that mistakes are made; that the mind fails to grasp the whole situation; that every new process has to be improved into a condition of successful working? The designer must think of many things and likewise, with a mind of human limitations, must overlook many things that afterwards prove themselves to be prime essentials. This accounts to a certain extent for that characteristic trait of the natural-born inventor. He conceives his fundamental idea, and then after completing a perfect (?) machine, suddenly discovers that there is a thitherto unthought-of law of nature coming into play whose influence must be met by an improvement, and so one improvement (?) follows another until the very spirit of the fundamental idea has been destroyed or the public demand has been satisfied by other inventions that did not require so much improving.

Steam vs. Electric Lines.—President Caldwell, of the Lake Shore road, is credited with saying that his line is so far a gainer by the operation of the electric suburbans which run out of Cleveland. That while the new lines with frequent service and lower fares have taken some of the local passenger business which formerly was hauled by the Lake Shore, that on the other hand the suburbans are good feeders, and bring passengers to them from points not on the Lake Shore line. These passengers some of them go long distances, and the earnings from one such would frequently amount to as much as that derived from fifty short haul passengers that have been lost on account of the electric. The more frequent stops will, for a long time give the steam roads an advantage in time on points more than ten miles distant, and as Mr. Caldwell says, when the competition gets too hot there is nothing to prevent him from building an electric line on their present right of way, outside of the existing steam tracks. The lesson for the steam road executives to study is where and when it will pay them to do this and thus forestall competition, which in some cases could have been prevented.—Street Railway Review.

The Deepest Shaft in the World.—At the greatest depth ever attained by miners the mines in the vertical Red Jacket shaft of the Calumet & Hecla copper mine, have stopped sinking at a depth of 4,900 ft., as this is the required depth necessary for this company to reach the limit of its underground territory. The Red Jacket shaft is the largest and best constructed mining shaft in the world. Its inside dimensions are 14 x 22½ ft., divided into six compartments and timbered throughout with pine. President Agassiz, in his report for 1893, stated that the "Red Jacket vertical shaft was planned after the two mine fires of 1887, in order to insure against the loss of the northern extremity of the mine in case of a similar disaster in the future, and to give access to the lower levels of the mine." The shaft was started in the fall of 1880. He further states "that nothing but the losses incurred by the succession of fires from 1884 to 1888 would have warranted us in starting so expensive an undertaking, and one of so doubtful utility, for the ordinary working of so narrow a belt as the Calumet conglomerate, which can be worked far more economically by slopes such as we have laid out in the South Hecla. The new shaft-rock house, which will be built of iron and will be made fire-proof throughout, is the only part of the work necessary to put this deep shaft in commission, as the hoisting machinery, which consists of two pair of triple expansion engines of 3,000 horse-power per pair, and will hoist a load of ten tons 60 ft. per second, was planned and put in place while the sinking of the shaft was going on. With the exception of the terrible accident caused by the engineer pulling the cage up to the roof of the shaft, by which ten miners were dashed to atoms at the bottom, no serious fatality occurred.

Mexicans as Railroad Employes.—Mr. C. P. Huntington is reported as being very favorably impressed with Mexican employes. He says that Mexican citizens continue to be employed in increasing numbers in all available avenues in the operations of the company, and their services have been well and faithfully performed during the year. With increased knowledge of railroad duties, they continue to supplant foreigners in the details of the company's operations. Apprentices are being educated in the different branches of the work. They are young men, he states, recommended by the civil authorities or who come from families in the neighborhood without other endorsement than their desire to learn a trade. They prove efficient, reliable and progressive. Mr. Huntington reports that at the close of the year 2,459 Mexican citizens were on the pay rolls of the company and the other enterprises affiliated with it south of the Rio Grande.

The Jungfrau Railway.—Competitive schemes are desired by the committee appointed to draw up preliminary plans and estimates for the proposed railway to the summit of Jungfrau. According to Engineering, of London, the sum set apart for the purpose of making awards to the successful competitors is about $5,950. The prizes in question are offered for the best solution of three different groups of problems. The first of these relates to the construction of the line, and plans are desired showing the tunnel profile, the lining if any, the kind of permanent way and superstructures proposed; the racks, points and switches. The question of electrical power transmission from the falls on the Lutschine river is also included in the first group, together with the designs for the cars, stations, club buildings and elevator from the last station to the mountain summit. The lift of the elevator is fixed at 328 ft., and the shaft is to be 26 ft. in diameter and to be provided with stairways. In the second group of problems, proposals are required for methods of executing the word, the driving of the tunnels, removal of spoil, and of precautions for the safety of the men. The third group is concerned with the working of the line, and competitors should deal with the question of maintenance of the way, the electric lighting of the tunnel, cars and stations, and with heating the two latter by the same agent. Finally, the security of the passengers and staff should also be considered in this connection. Such plans as are sent in will be considered by experts, on whose recommendations the premiums will be awarded. Successful competitors will have no further claim on the committee, as the prize is to be considered as payment in full for the use of the premiated designs. Unsuccessful memoirs will be restored to their originators and will remain their private property. The maximum gradient of the proposed line is fixed at 1 in 4, and the minimum radius of curvature at 328 ft. The maximum width of the cars must not exceed 8.2 ft., and the greatest hight 9.84 ft. The speed has been fixed at from 4.3 to 6.2 miles per hour. The water power available is 5,000 horse power effective. The falls are situated at about five miles from the proposed starting point of the line, which will be about 1.5 miles from the tunnel-portal. The total length of tunnel will be about 6.2 miles.

Cleaning Cavities in Iron Work.—To get the cores entirely removed from small castings is something of a job, and tumbling does not always do the work satisfactorily. Here is an idea that is worth trying, says J. H. Allen in Dixie as I have seen it worked successfully in one place. It should be added, however, that it is only applicable to brass. Before the casting is perfectly cold dip it into water, and the steam formed on the surface of the metal will blow off every particle of sand and leave the casting as fresh and clean as though its interior had been made into a tumbler and run until it was worn bright. It will not do to be careless in the handling, since if the metal is plunged in too hot it is apt to be softened or cracked; but after a short experience the scheme can be worked as a great labor saver. The man I saw using it would handle his pieces about as fast as the ordinary laborer could be prevailed upon to throw them into a tumbler. This use of steam is a great thing for blowing chips out of the bottom of a deep hole. A few years ago I had occasion to drill some ¾ in. holes into a shaft to the depth of 13 in. To clean them with a worm and waste was simply impossible, but a blast of steam from a 3-16 in. nozzle run down to the bottom of the hole did the work in about 30 seconds. We used steam because we did not have compressed air, but the latter would have been more satisfactory still, since it makes no sloppy muss. And apropos, how can anyone in this day and generation, get along without an air compressor and hoists? While I am

on the subject of cleaning out deep holes, let me add that, when they are being drilled, the drills sometimes break off short, and this will surely be when the hole is nearly finished, and the piece left behind is invariably wedged into the hole in the tightest possible manner. I drilled the holes above referred to with home-made flat drills and breakages were not uncommon. On the first occasion I attempted in vain to pull the piece out, but a resort to gunpowder did the job. I poured in enough rifle powder to cover the piece, first running a fast burning fuse down to the bottom of the hole, then rammed in about two inches of paper and touched it off. There was a report, a scattering of coal in the bin towards which the improvised gun was aimed, and the broken end of the drill was lost to our sight forever, while a fresh drill was used to finish the hole.

INCREASE OF HEATING SURFACE IN LOCOMOTIVES.

New York, April 20, 1896.

To the Editor of the Railway Review:

If railway mechanical engineers of recognized integrity, ability and experience in their profession, should state in print or over their own signatures, that if a certain improvement in the motive power of our railways could be brought about, they saw where one hundred millions of dollars per annum could be saved with a comparatively limited initial outlay, can any one doubt that all those interested in railways, including the stock and bondholders, would be clamorous to have the matter investigated and an experiment made to ascertain definitely, whether the foreshadowed mechanical engineers were correct in making such an extraordinary statement. Let us see if any such statement has in effect been made by gentlemen to whom all the provisional attributes named will apply: if made, what support they have in making it: and whether we cannot suggest the means by which the improvement can be made and the above magnificent sum realized, to the infinite satisfaction and delight of the domestic and foreign holders of our railway securities, and equally so to our railway officials themselves.

In two able papers read before the Western Railway Club at the December 1895 meeting by Mr. J. H. McConnell, superintendent of motive power of the Union Pacific Railway, and at the January 1896 meeting, of the same club by J. N. Barr, superintendent of motive power of the Chicago, Milwaukee & St. Paul Railway, both of which were published respectively in the Railway Review of January 18 and February 22, the following remarks occur: Mr. McConnell says, "an increase of one car, containing 20 tons of freight, in each train, will increase the earnings of a locomotive in one year $7,200, and the only additional expense would be 90 tons of coal. Taking the average mileage of a locomotive at 3,000 miles per month, or 36,000 miles per year, we have the revenue of 20 tons of freight hauled the same mileage at 1 cent per ton per mile or 20 cents per mile per car. There has been no increase in the wages of the engineer, fireman or trainmen, or for repairs. The only extra expense has been five pounds of coal per car mile. * * * * * * *

"The problem of to-day with decreased rates is to haul greater tonnage in each car and reduce the cost of doing it. The revenue of a railroad is derived from the service rendered by its locomotives. To increase the revenue the locomotive must do more work. The tendency is to increase their weight and size, and there is not enough attention paid to getting increased service of those now owned. The freight earnings largely exceed the passenger earnings, and by directing efforts to hauling increased tonnage, the revenue is increased without any great increase in the operating expenses. The weight of a train over a division is usually determined by the amount of tonnage an engine can haul over certain grades. In nearly every case increased tonnage can be hauled if the mechanical and transportation departments work together. An increase in the steam pressure of five pounds will, in many cases, take one more car over the grade.

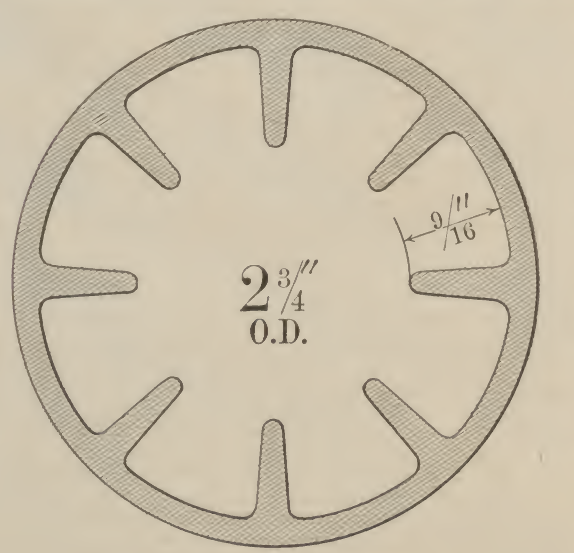
"When the mechanical departments of our railroads give the same attention to increasing the train haul that they do to making a showing of how cheap they can run the locomotives per mile, they will find they have obtained increased service from the locomotive, decreased the cost of hauling a ton of freight, and increased the revenue of the company. The problem of to-day is, how much does it cost to haul a ton of freight one mile, not what does it cost per mile to run your locomotives."

Mr. Barr says, "A favorite argument of tranportation men is: If a locomotive can haul one additional loaded car of 30 tons capacity per train, the earnings of that locomotive will be increased about $7,000 per year, so that a little increase in expenses for larger locomotives and permanent way is so trifling as not to be taken into consideration. This seems to be the favorite method of figuring in all departments. The gain in the particular department considered is shown to be something very striking—the increased expense to other departments an item not worth considering. If the transportation man would keep his reasoning strictly within the bounds of his own department, and take the position that, if he loads each train so as to get 30 tons additional weight of paying freight into each train hauled by a certain locomotive without increasing the size of the locomotive or the cars, or increasing the number of cars per train, the earnings of locomotives would be increased $7,000, his position would be unassailable; and if he should carry this theory into practice, the results would be such as to create a very agreeable impression on the minds of the members of that department which is most immediately interested in the net results arising from the operation of the railway as a whole."

As the truth is said to lie between the two extremes, suppose we take the mean of the statements of Mr. McConnell and Mr. Barr as the basis of our argument and assume as a fact, that if a locomotive can be made to haul 25 tons additional weight of paying freight per train, without increasing the size of the locomotive or the cars, or increasing the number of cars per train, the claim that the earnings of each freight locomotive would be increased $7,000 per annum would be made good. Let us see what this assumption would amount to in this country of ours, leaving the rest of creation to look at the matter through their own goggles, aided by their own system of arithmetic. In Poor's Manual of Railroads for 1895 the number of locomotives credited to the United States is 35,813. I shall confine my remarks in this communication to freight locomotives, although I believe they will apply with almost equal force to those used for passenger service. In the "Interstate Commerce Commission Statistics of Railroads in the United States" for 1894, the number of freight locomotives in service in this country is set down at 20,000, and the passenger engines at 9,893, which numbers are probably somewhat increased since. The remainder, by this authority, are switching and unclassified locomotives. Now, if 20,000 locomotives were in actual freight service all the time, and by a very simple improvement could be made to haul 25 tons more paying freight per train than they now do, we will say for the sake of argument, that it is conceded they would earn $7,000 per annum more than they do at present, or multiplying the 20,000 locomotives by $7,000, they would increase their earnings in this country by $140,000,000 per annum.

But we know that the whole number of locomotives are not in active service all the time, and we also know that one of the conditions named by Mr. Barr to insure the increased earning of $7,000 per annum per locomotive, cannot be met without an increase in size or in number of freight cars to carry the additional 25 tons per train, and to meet this necessity and to make a liberal allowance for the locomotives that are not in active service all the time, and for other contingencies, such as an increase in fuel burned to obtain the increased power, I throw off $40,000,000, and claim that the net earnings by an increase of hauling power of 25 tons by each freight locomotive in active service in this country, cannot by any reasonable deduction from the facts named be less than one hundred millions of dollars per annum; mind you, per annum, or to reduce it to percentages, say over 244 per cent per annum on the entire cost of the improvement if it had to be borne every year, which as a matter of course would not be the case, so that after the first year the percentage due to the improvement would be over 344 per cent per annum on the initial outlay.

Now, what is the improvement referred to that is going to produce this increase of revenue and prove such a "bonanza" to our railways, and what is it going to cost to adapt it to the whole number of freight locomotives at present in use in this country? The improvement is the "Serve ribbed tube," which will cost for the average "up-to-date" locomotive about $1,200, and changing the tube-sheets will cost about $250 more, together making $1,450, which for the 20,000 freight locomotives in the United States would



amount to $29,000,000. I do not expect that the improvement will be made all at once, or I hope not at any rate, as it would over-tax our present ability to supply the tubes, but if made at a moderate pace the increased revenue from the locomotives would pay for the improvement in a very short time, besides leaving a heavy balance to the good in the treasuries of the railways adopting it. Now, where is the evidence that this initial outlay of $29,000,000 is going to produce $100,000,000 per annum? The evidence is at hand and can be relied upon. The French railways find, after exhaustive experiments covering several years in actual service, that by substituting Serve tubes of 2⅝ in. outside diameter, one meter (39.37 in.) shorter than they formerly used plain tubes 1¾ in. and 2 in. outside diameter, they get an increased evaporation of 20 per cent without loss of economy; that is to say, they are enabled to burn 20 per cent more coal, and in burning it "economically" as the Serve tubes insures its being done, they get a corresponding increase of power, and they consider, as all practical men must, that this increase of power is of many times more value than the cost of the fuel required to produce it.

In a large sense, fuel is the foundation of power, the source from which it necessarily emanates. This is assuredly the case where steam is the agent employed in the development of power, and it is therefore, primarily, only in the proportion that fuel can be economically burned that power can be increased. We are getting practically the same advantage with the Serve tube in the Scotch Marine type of boiler in connection with the Ellis & Eaves system of induced or suction draft, that is obtained on the French railways in locomotives, so that here is additional proof that there is no uncertainty in result if the Serve tube is used under favorable conditions, and I shall be happy to forward the evidence of this to any one requesting it. The tubes on the French railways are used of considerably shorter lengths than with us, namely, for spaces slightly less than 19 ft. between tube-sheets, so that we recommend a slightly larger diameter, namely, 2¾ in., that there may be no question about the tube freeing itself of soot and cinder as readily at least as the plain 2 in. tube in common use now does. If it is found necessary, we can reduce the length of the ribs as much as seems advisable and supply the tubes with plain ends to make out the required length, whatever that may be. It will be a comparatively inexpensive matter for each railway to determine for itself just what the most desirable length of ribs will be, because this will naturally vary somewhat with the character of the coal used. I am of course aware that if the length of the ribs is reduced, the percentage of advantage in heat-absorbing surface will also be reduced, but there will be length enough of the ribs remaining under any circumstances to haul the additional 25 tons of freight per train with the necessary cars to carry it, and it is upon this basis that the claim of economy is made and admitted by by Mr. McConnell, Mr. Barr and the transportation men.

An additional and very cogent reason for the use of tubes that will generate more steam than the plain tube in common use, is given in the following extract from a valuable paper on the "Hauling Capacity of Locomotives" read by Mr. H. H. Vaughan, mechanical engineer of the Great Northern Railway, at the January 1896 meeting of the Northwest Railway Club. He says: "The actual tractive force for any engine varies to a certain extent with the length of time it has to be maintained. An engine is usually capable of exerting considerably more power for a short time than could be developed continuously, due to the amount of steam used being above the capacity of the boiler, so that a lower percentage of the total tractive force must be taken for long heavy grades, than for short ones. Poor water and other causes that will suggest themselves to you also make it necessary to decrease the percentage of total tractive force that can be developed as actual where such detrimental factors occur." The Serve tube by reason of its ribs, contains 90 per cent more heat-absorbing surface and 60 per cent more weight of metal than the ordinary plain tube of the same diameter, and a very important point in favor of the use of the Serve tube in all locomotives is, that it is always desirable to have some reserved power in a boiler, and particularly in a locomotive, where the weight of the trains at different times and at different seasons of the year, whether in passenger or freight service, is certain to vary considerably.

The vast majority of the heat passing through a plain tube is entirely lost and passes into the smoke-stack or chimney essentially unused, and the stronger the draft the greater the loss of heat. The action of the draft in a locomotive, or in any tubular boiler where the fire passes through the tubes, is to draw the products of combustion into the center of the tube and away from the friction of its walls, and thus to deprive it very largely of its power to absorb or take up the heat, except what comes from radiation, which is enormously less than that imparted by actual contact with the metal. When the gaseous stream enters the tube it fills up the orifice, but it immediately begins to stretch itself out and is much thinner or less voluminous on its exit into the smoke-stack or chimney. The ribs in the Serve tubes penetrate the gaseous stream on all sides, retard and extract the heat from it as it passes through, and convey it to the surface of the tube which is made much hotter, and consequently in a condition to evaporate more water.

If the sole object in tubing a boiler is to get "heat-absorbing surface" for the purpose of evaporation, can any mechanical engineer reasonably doubt that a locomotive will haul an increased load of 25 or even 50 tons more freight, if fitted with tubes that will at the lowest calculation shown in the annexed table in the various spacings named, give it over 57 per cent more of this surface to absorb or take up the heat, if

the tubes can be kept as free from soot and cinders as the ordinary plain tubes now are? Mr. McConnell says, "An increased steam pressure of five pounds will in many cases take one more car over the grade." Can it be questioned for one moment that the increased heating surface due to the ribs in the Serve tubes will produce considerably more than this additional pressure? I am of course aware that there are other things to be considered in estimating the hauling power of a locomotive besides increasing the generation of steam in its boiler, such as the capacity of the cylinders and the adhesive weight of the engine to make its use effective; but is there any other improvement hitherto suggested, that offers the same inducement at so small an outlay for an experimental trial on the part of every railway, to ascertain for itself and in its own way, whether the enormous saving which I have endeavored to show in this communication is possible of realization, by simply changing the character of the tubes in its locomotive boilers? C. W. Whitney.

66 Broadway, New York.

Heat Absorbing or Fire Surface of Plain and Serve's Ribbed Tubes per square foot of Tube Sheet.
In diagonal rows or staggered.

Outside diameter and discription of tubes.	Spaces between tubes.	Number of tubes per square foot tube sheet surface.	Area for passage of the gases per sq. ft. tube sheet.	Heating absorbing or fire surface per foot of length per sq. ft. of tube sheet	Percentage of increase in favor of Serve ribbed tubes.
			sq. in	sq. ft.	
2 in plain....	⅝ in.	24.4	62.37	11.47	66.3 p. c.
2¾ in. ribbed	⅝ in.	14.55	62.42	18.73	
2 in. plain...	¾ in.	21.8	55.72	10.3	73.1 p. c.
2¾ in. ribbed	¾ in.	13.85	59.41	17.83	
2 in. plain...	¾ in.	21.8	55.72	10.3	57.2 p. c.
2¾ in. ribbed	⅞ in	12.58	53.97	16.2	
2¼ in. plain	⅝ in.	20.1	66.61	10.86	72.4 p. c.
2¾ in. ribbed	⅝ in.	14.55	62.42	18.73	
2¼ in. plain	¾ in.	18 4	60.97	9.94	79.3 p. c.
2¾ in. ribbed	¾ in.	13.85	59.41	17.83	
2¼ in. plain	¾ in.	18.4	60.97	9.94	63 p. c.
2¾ in. ribbed	⅞ in.	12.58	53.97	16.2	
2½ in. plain	⅝ in.	17.27	70.7	10.32	81.5 p. c.
2¾ in. ribbed	⅝ in.	14.55	62.42	18.73	
2½ in. plain	¾ in.	15.84	64.84	9.47	88.2 p. c.
2¾ in. ribbed	¾ in.	13.85	59.41	17.83	
2½ in. plain	¾ in.	15.84	64.84	9.47	71 p. c.
2¾ in. ribbed	⅞ in.	12.58	53.97	16.2	
				Average	72.11 p. c.

Call for National Convention of Railroad Commissioners.

By authority of the convention of railroad commissioners, held at Washington, D. C., on the 14th and 15th days of May, 1895, and pursuant to a resolution thereof fixing the date for the next annual meeting of the same, notice is hereby given by the undersigned committee designated for that purpose, that the eighth annual convention of said commissioners will be held at the office of the Interstate Commerce Commission, No. 1317 F street (Sun building), in the city of Washington, D. C., on Tuesday, May the 19th, 1896, at 11 o'clock in the forenoon.

The railroad commissioners of all states, and state officers charged with any duty in the supervision of railroads, are respectfully requested to attend and participate in the discussion of such topics as may come before the convention. The Association of American Railway Accounting Officers is also invited to attend, or send delegates to the convention, and join in the consideration of such questions of special interest to their association as may arise.

At the last convention committees were appointed on the following subjects and directed to report to the next convention:

1. Railway statistics.
2. Uniform classification.
3. Legislation.
4. Protection of public interests during railway labor contests.
5. Regulation of state and interstate electric railways.
6. Powers, duties, and actual work accomplished by the several state railroad commissions during the year.
7. Government control and government regulation of

y appliances.
ng of freights and division of earnings.
lowing resolution was adopted at the last meeting.

"That a committee of five be appointed to select officers for and subjects to be presented at the next annual convention of this association, to solicit papers upon the same, either from members of the association or from those not connected with the organization, and to prepare as far as possible, a program of proceedings."

The following committee on organization and program for the next convention was named:

George M. Woodruff, of Connecticut; G. G. Jordan, of Georgia; Ira B. Mills, of Minnesota; E. C. Beddingfield, of North Carolina; Edward A. Moseley, secretary of the Interstate Commerce Commission.

Members of former conventions are entitled to participate in the discussion of subjects at the coming meeting. The various state commissions should be represented by full boards as far as possible, and to that end all railroad commissioners are earnestly requested to attend the coming meeting.

Simeon R. Billings, of Michigan, Chairman.
John W. Currie, of North Dakota, Vice-Chairman.
Edward A. Moseley, Secy. Interstate Commerce Com., Secretary
Martin S. Decker, Assistant Secretary

ELLIOTT'S ELECTRICALLY LOCKED SWITCH STAND.

The device of which a general view is shown in Fig. 1, and the details, in Fig. 2, is designed to put the control of the switch in the hands of an operator who is generally at some distance away, and to assist in the maintenance of an absolute block, irrespective of the number of switches in the main line between the two block stations.

As will be seen by reference to Fig. 2, the arrangement used is that of a lock bar attached to the

Fig. 1.—GENERAL VIEW.

points of the switch and a plunger fastened to the stand, the movement of the plunger being controlled by means of a magnet, the armature of which, when down, drops into a notch cut in a slide locking it, the slide being connected to the plunger by a crank which is used to lift the plunger when the slide is released. If the magnet is energised the armature will be attracted and lifted out of the notch, allowing the slide to be pulled back, lifting the plunger and unlocking the switch. The bar lock, which is moved by the points of the switch, is attached to the switch head rod in the same manner as the connecting rod, one bolt being used for both. The other end of the lock bar is made to pass through a guide fastened to a plate bolted to the bottom of the

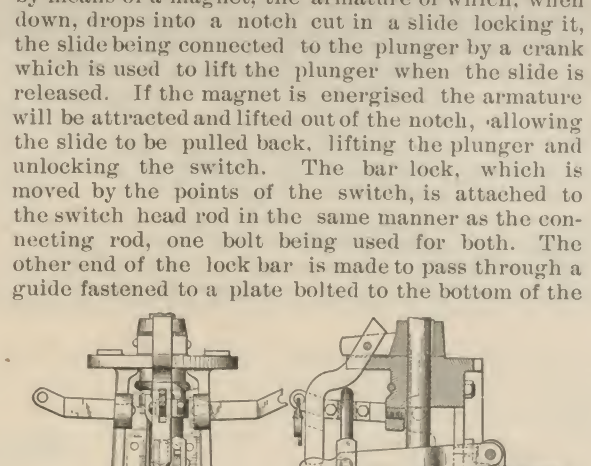


Fig. 2.—SECTIONS.

stand, the bar and with its points of the switch being securely locked whenever the bar is brought into a position where the plunger can drop through the hole drilled in the bar.

To insure that the switch when closed will always be locked, unless released by the operator, the upper end of the plunger is brought up under the switch lever in such a way that the switch cannot be shut, and locked in the usual manner, without forcing the plunger or lock rod through the lock bar and allowing the armature to drop in the notch in the slide, locking it until the magnet is again energized. To show when the armature has been raised and the switch unlocked, a small indicator is provided which will drop and show a white disc behind a small glass window set in the side of the magnet box, as soon as the slide is released, anyone desiring to use the switch being required only to watch the indicator. It is not necessary to try the handle to see if it had been unlocked.

The indicator having shown white, to work the switch, both levers are raised together. The raising of the switch lever allows the plunger to be raised at the same time and withdrawn from the hole in the lock bar before the switch lever has cleared the slot in the stand and the spring of the points has been brought to bear on the lock bar. When the switch lever has been raised to a horizontal position, and turned slightly, the lock lever can be dropped and the switch turned in the usual manner. To enable the operator to know when the switch has been opened, and also if it has been properly closed, a circuit breaker is provided in the magnet box, which breaks the circuit through the magnet as soon as the slide has been partly withdrawn. A disc indicator is placed in the tower or office and is put in the circuit to show whether the circuit is complete or broken. When the switch is at any great distance away, magnet bells, or a telephone, can be provided for purposes of communication the wires used for operating the switch being used for this purpose and the cost of additional wires saved.

This switch lock, which has been patented by Mr. W. H. Elliott, signal engineer of the Chicago, Milwaukee & St. Paul Railway has been in use upon that road for over a year and has given excellent results. As will readily be seen, the circuit used is of the simplest kind, and if properly installed few or no failures should occur. In case of failure all that is necessary to do, to put the electric locking feature out of service is to unscrew the bolt fastening the lock bar to the head of the switch when the stand and switch can be operated in the usual mnnner.

ASSOCIATION OF RAILWAY AIR BRAKE MEN.

The proceedings of the first day of the Boston convention of the Association of Railway Air Brake Men were outlined in the Railway Review of last week and the work of the second day began with the presentation of the report of the committee on water raising systems for sleeping cars which was briefly discussed. Mr. Jesson complained that the Pullman people changed their apparatus so often as to render it impossible to keep posted on the details. In designing no thought seemed to be given to accessibility for inspection and repairs and valves were often placed in inaccessible positions. Mr. Nellis said the system was not a familiar one among air brake men and was apparently less so to the Pullman employes. He had traced several cases of slid wheels to the leakage of the valve between the air tank and the auxiliary reservoir. The difficulty on account of leakage and bad condition of the apparatus was spoken of by others and the latest designs were found to give no better satisfaction than earlier ones which was principally on account of want of care and inspection. It was developed in the discussion that the Wagner Company found the water raising system unsatisfactory and therefore abandoned its use.

The second report to be considered was that upon economical oiling of air brake cylinders. Mr. Pratt had obtained good results upon the Chicago & Northwestern Railway, from oiling and cleaning cylinders once a year for several years. Mr. Farmer and several others gave good reports of satisfactory results which had been obtained by the use of Kent's compound in car and driver brake cylinders. Mr. McKee reported that he had made tests of two kinds of grease and also with West Virginia well oil. The latter was found to be entirely gone after five months of service upon the cars. One of the greases had left the walls of the cylinders in fair condition and the other had kept the packing and the cylinders in as good condition as the day that they were applied. He had found this one apparently good for a year's service. Several members thought that local rules would be required for some freight cars in order to insure their being oiled with sufficient frequency.

The subject taken up next was the maintenance of freight and passenger brakes. The chairman, after reading the report, gave the results of the test which he had made on the time required to charge a storage reservoir in a yard plant through one-half mile of ¾ in. pipe. The time was so short as to prove that such a small and cheap line could be used if the reservoir capacity near the pump and in the yard were suitable. Considerable discussion was devoted to the cleaning of the drain cup and several members said that they did not clean them as recommended but removed the cup entirely and blew the dirt out with steam or removed it by soaking in a lye bath. The question of defect cards was brought up. One member from the Pennsylvania Railroad said that freight conductors as well as inspectors were required to make reports and in case of disagreement the one neglecting to mention a defect was taken to task and in this way the reports formed a check upon each other. Mr. Frazer of the Southern Pacific spoke of the experience of that road in using similar reports which had included hot boxes and pulled out draw bars. Mr. Farmer favored the use of defect cards because if issued at a point where facilities for making repairs were lacking, the card could be tacked to a car and the repairs made further along the line. The use of gaskets was considered, many roads reporting better results with leather than with rubber for car work and also for locomo-

tives. In these cases the leather was prepared in the same way as brake piston packing.

The proceedings of the last day of the convention included the reading of the report on main reservoirs and connections, compressed air train signals and several topical discussions. The place of holding the next meeting is Nashville, Tenn. The officers elected were as follows: President, Mr. S. D. Hutchins; first vice president, A. J. Cota: second vice president; C. P. Cass; third vice president, W. F. Broadnax; secretary, P. M. Kilboy; treasurer, Otto Best.

SYRACUSE STATION—N. Y. C. & H. R. R. R.

Bradford L. Gilbert, Architect.

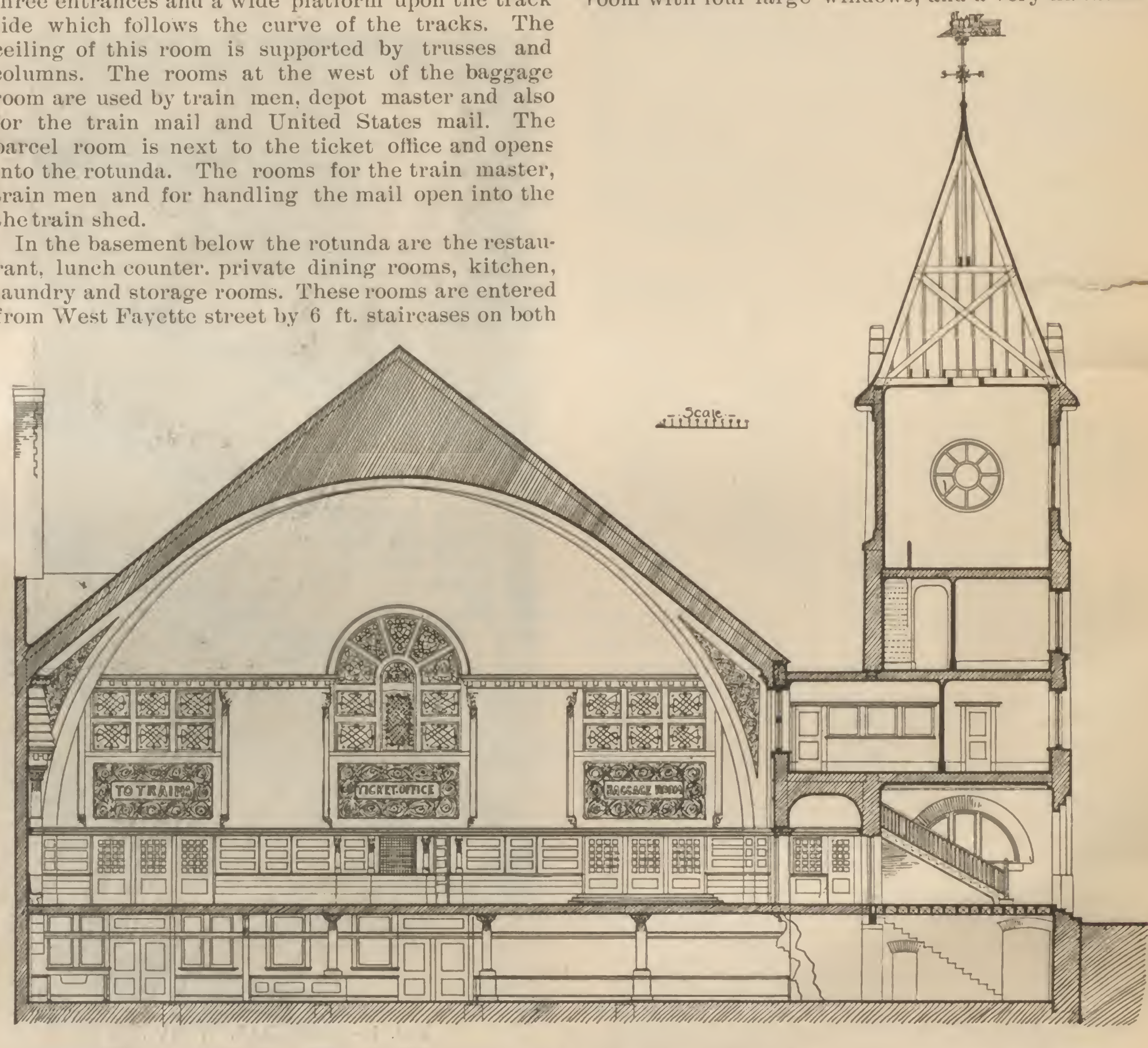
Through the courtesy of Mr. Bradford L. Gilbert, we are enabled to illustrate and described the new Syracuse Station of the New York Central & Hudson River Railroad of which he was the architect. The station is 94 x 122 ft. and the train shed is 128 x 480 ft. The building is Romanesque in design and exceedingly attractive in appearance, Mr. Gilbert having brought to bear his wide experience in station designing upon this work. The building is of Milford granite trimmed with dark red Potsdam sandstone, all rock faced and laid in random courses. The roof of the main building and tower are glazed Spanish tile with crestings, tips and terminal of the same. The tower has four stories with a tapering roof. The main entrance to the building is upon Fayette street and over the walk is a porte cochere 38 ft. long and 16 ft. wide extending two feet over the curb line. This has a glass roof. The main floor of the station is about 12 ft. above the street at this point. Onondaga creek flows under the train shed through a series of arches over which the tracks are placed. The train shed is of steel and cost $90,000.

The rotunda of the station is entered from the Franklin street side through a lobby and from the Fayette street entrance the stairs lead directly into the rotunda which is 90 x 90 ft. and 50 ft. high, the roof being supported by four ornamented steel trusses. The floor of the rotunda is of oak and it is finished in the same wood. The wainscoting is of quarter sawed oak, the panels reaching to the door heads, as shown in the illustration in Fig. 1, which is a section looking north toward the ticket office. The spandrels of the trusses are ornamented with staff. The arrangement of adjoining rooms and the location of the tracks are shown in Fig. 2, which is a general ground plan of the whole station. The rotunda is provided with a fire place upon the west side with a handsome oak mantel. The newstand and telegraph office are up on the east side and project 10 ft. into the room in the form of a semi-circle. A drinking fountain is provided fitted with cooling pipes with which the ice comes in contact in the basement.

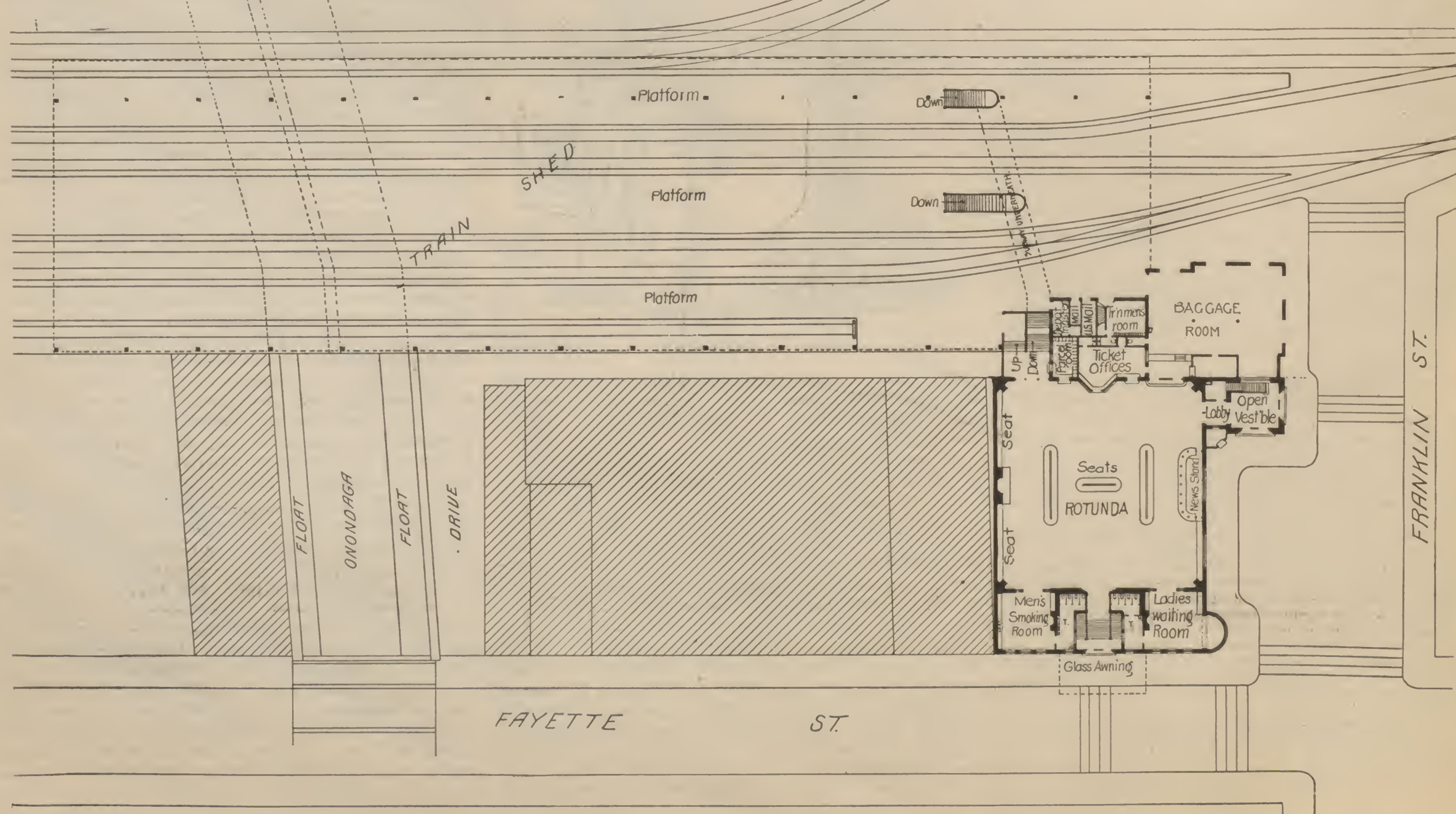
At the northwest corner of the rotunda is the entrance to the sub-way the door being shown at the left in Fig. 1. Next to this door is the ticket office and at the right of this is the entrance to the baggage room. At the south east corner of the rotunda is the woman's waiting room to which a bay window with a 9 ft. radius adds greatly to the attractiveness. The arrangement of the adjoining rooms and the men's smoking room is shown in Fig. 2. The arrangement for the ticket office with reference to the baggage room is noteworthy as it makes it possible for a passenger to procure tickets and attend to baggage with the least possible loss of time. The office of the Wagner Palace Car Company is next to the ticket office. The entrance to the baggage room is 24 ft. wide. The room is 50 x 57 ft. and has a concrete floor throughout. It has three entrances and a wide platform upon the track side which follows the curve of the tracks. The ceiling of this room is supported by trusses and columns. The rooms at the west of the baggage room are used by train men, depot master and also for the train mail and United States mail. The parcel room is next to the ticket office and opens into the rotunda. The rooms for the train master, train men and for handling the mail open into the the train shed.

In the basement below the rotunda are the restaurant, lunch counter, private dining rooms, kitchen, laundry and storage rooms. These rooms are entered from West Fayette street by 6 ft. staircases on both sides of the main entrance to the rotunda, which makes the dining rooms easily accessible from the rotunda and the street. It is also reached from the north side of the rotunda by stairs to the subway 10 ft. wide. The lunch room, 30 x90 ft., with 90 ft. of lunch counter, extending the entire length of the rotunda, north and south, and from stairs to stairs. The cornice and frieze of this lunch room is ornamented with elaborate foliage decoration, in which electric lamps are set every three feet in the center of rosettes, especially designed for them. The kitchen, 30x40 ft., in the northwest corner, has an entrance from the alley for supplies, coal, etc. It is arranged with all the most approved conveniences, has a 9 ft. range with a massive hood to take away the fumes of cooking. There are ample dressers, lockers and tables, sink, etc., and the room is ventilated by means of a 24 in. exhaust fan at the alley window. The serving pantry is 30x30 ft., under the southwest corner of the rotunda, and to the south of same under the smoking room, are large store rooms, refrigerators and service rooms.

Under the ladies' waiting room, and having a similar bay window on the corner, is a private dining room with four large windows, and a very handsome oak mantel. The main dining room fronting on Franklin street, 38x45 ft., is adjoining the private dining and lunch rooms. These three rooms are decorated alike, with panelled oak wainscoting 3 ft. 6 in. high. The walls are painted rough to the hight of a frieze molding, which runs around the walls 8 ft. high. The iron columns to support the rotunda in these three rooms are finished in scagliola, in imitation of sienna marble. The capitals of columns and cornices of rooms are touched up with gold, and when lighted at night are very brilliant. In the day time the amber leaded glass in the windows gives a very warm and rich effect. The northeast portion of the basement is reserved for the storage cellar and



SYRACUSE STATION—NEW YORK CENTRAL & HUDSON RIVER RAILROAD—Transverse Section.



SYRACUSE STATION—NEW YORK CENTRAL & HUDSON RIVER RAILROAD—Fig. 2.—General Plan.

laundry, fitted up with tubs and a steam dry room complete. There are ample toilet and wash rooms for patrons and help, at both entrances to the restaurant. The northerly entrance will be used in conjunction with the subway to reach the various platforms to the tracks in the train shed.

The second floor of the north wing is given up to offices to the division superintendent the Wagner Palace Car Company, dispatchers and conductors. Convenient bath rooms are provided for the use of the local officers. The arch leading from the rotunda to the subway is 20 ft. wide leading to two 10 ft. stairways shown in the illustration. The left hand stairs lead to the train shed platform and the others to the subway beneath the tracks. At the foot of the subway stairs is a Gaustavino dome 10 ft. 6 in. across. The lining of the subway is Gaustavino tile and the floor is of mosaic white marble. The first stairway leading to the tracks is 7 ft. wide and 20 ft, beyond is a second one 5 ft. wide. The first leads to east and west bound trains and the second to the New York Central west bound and R. W. & O. trains. The power plant is 28 x 128 ft. It is entered from the subway and is located under the south track running east and west. The public has access to a space 6 x 28 ft. at the subway, and which is enclosed by a polished brass rail. The two large easy running Ball & Wood direct connecten engines and dynamos, are seen from this point. The large switch board is 6 x 8 ft. of white marble, with a colored marble border, complete with the various large switches, volt meters and ammeters. The engineer's room 10 x 15 ft. with the toilet room are also at the east end of the power plant. The engine room is lined 8 ft high, with white glazed tile, and has a floor of rich red encaustic tile.

To the west of the engine room is the boiler room 28 x 50 ft. with three large locomotive boilers, and to the extreme west is 28 x 30 ft. space for the storage of coal and oil. This power plant is above

was 2,500 ft. long and the work included the building of warehouses and elevators. A contract has recently been taken for a 1,000,000, bushel elevator for the Illinois Central Railroad at New Orleans which is to be built this coming summer. The experience of this firm has been wide especially in connection with railroad contracts. The Cleveland shops of the Big Four road were constructed by them also the Chillicothe, Ohio, shops of the B. & O. S. W. Ry., the Pennsylvania Railroad freight station in Cincinnati and fifteen stations in Ohio for the B. & O. Railroad. Among the noteable recent buildings mention should be made of the buildings for the Cataract Construction Company and for the Pittsburgh Aluminum Company at Niagara Falls. They will build the state capital at Sedalia, Mo.

A COMPOUND SWITCHING LOCOMOTIVE.

The accompanying illustration was taken from a photograph of a six-wheel compound switching locomotive which has recently been built by the Schenectady Locomotive Works from designs by Mr. Wm. Buchanan, superintendent of motive power and rolling stock of the New York Central & Hudson River Railroad. The object of the design was to produce a locomotive which could be worked without noise from the exhaust to be used in making up passenger trains in the Grand Central Station in New York.

This is accomplished by use of the two-cylinder compound arrangement, the exhaust reservoir in front of cylinders, and an annular variable exhaust pipe in smoke box, with the result that the engine in the heaviest service is practically noiseless. The high pressure cylinder is 19 x 24 in., and the low pressure cylinder 29 x 24 in. The intercepting valve is of the Schenectady Locomotive Works improved type. The exhaust of the low pressure cylinder

Diameter and length of driving journals ....8 in. diam. x 9 in
" " " main crank pin journals. 5½ in diam. x5 in
" " " side rod crank pin journals.....Main, 5¾ in. diam. x 5 in.; F. & B. 4½ in. diam. x 3½ in

Boiler.

Style........................Wagon top
Outside diameter of first ring........................60 in
Working pressure........................180 lbs
Material of barrel and outside of fire-box............Carbon steel
Thickness of plates in barrel and outside of fire-box..Throat ⅝ in., balance 9-16 in
Horizontal seams.....Butt joints, sextuple riveted, with welt strip inside and outside
Circumferential seams........................Double riveted
Fire-box, length........................107⅛ in
" width........................42 in
" depth........................Front 72 in., back 69 in
" material........................Carbon steel
" plates, thickness...Sides 5-16 in., back 5-16, crown ⅜ in. tube sheet 9-16 in
" water space....Front 4 in., sides 3 in., back 3 in. at bottom, tapering to 4½ in. at top
" crown staying......5x¾ in, crown bars welded at ends
" stay bolts........... 1 in. diam. Burden's stay bolt iron
Tubes, material........................Mild steel No. 11 W. G.
" number of........................271
" diameter........................2 in
" length over tube sheets........................11 ft
Fire brick, supported on........................
Heating surface, tubes........................1,547.5 sq ft
" " fire-box........................162 sq ft
" " total........................1,709.5 sq ft
Grate " ....31.24 sq ft
Grate, style........................Rocking, no drop plate
Ash pan, style........................Sectional, with dampers F. & B.
Exhaust pipes..............Single, muffled through exhaust box
Exhaust nozzles........................Variable, 5 and 8 in, diam.
Smoke stack, inside diameter.....20 in. at top, 16¼ in. at bottom
" " top above rail........................14 ft 6 in
Boiler supplied by..........Two No. 8 N. & Co. Monitor injectors

Tender.

Weight empty........................28,500 lbs
Wheels, number of........................8
Wheels, diameter........................30 in
Journals, diameter and length................3¾ in. diam. x 7 in
Wheel base........................14 ft 4½ in
Tender frame. Schenectady L. W. standard 6½x4x¾ in angle iron
Tender trucks.....Standard channel iron, center bearing F. & B.
Water capacity........................3,000 U. S. gal

SCHENECTADY COMPOUND SWITCHING LOCOMOTIVE DESIGNED BY WM. BUCHANAN.

the alley or driveway, and below the tracks which are 18 ft above the alley level.

The train-shed has an outside cantilever awning upon the north side. The roof is supported by two rows of 16 columns each and was constructed by the Buffalo Bridge Company. The roof trusses are 109 ft. long. Along the south side the shed is supported upon a retaining wall 18 ft. high which extends its full length. Beginning upon the north side the arrangement of tracks and platforms is as follows. Two R. W. & O. tracks, a platform 32 ft. wide, main line R. W. & O., main line west bound track, platform 36 ft. wide, main line east bound track, Auburn road incoming track, platform 25 ft. 6 in. wide and on the southside is a spur track for Auburn outgoing trains. This arrangement was made to avoid switching in the station. The platforms are of cement and extend the whole length of the shed. The roof is high and the building is well lighted and ventilated. The artificial lighting is by means of an Eddy four pole 115 volt dynamo furnishing current for 1200 incandescent and 20 arc lamps the latter being in the train shed. The rotunda has 500 incandescent lamps by which it is brilliantly lighted and the effect given is pleasing. The wiring is in iron conduits.

The work was done under the direction of Mr. Walter Katte chief engineer of the road and this together with the reputation of Mr. Gilbert is sufficient guarantee of its excellence of design and execution. The contract was taken by Messrs. James Stewart & Company of St. Louis the firm consisting of Mr. James Stewart and his sons Messrs. John L. Stewart, Alexander Stewart, and James Stewart, Jr This company has recently built large docks at New Orleans and at Erie, Pa. The New Orleans dock,

passes through a large pipe to the reservoir in front of smoke-box and thence through into the variable exhaust in the smoke-box. The exhaust reservoir is provided with perforated plates through which the steam passes. The exhaust from the air pump is also muffled by passing through the exhaust reservoir. The engine steams very freely, is very quick in its action, and fills a long felt need of a noiseless switching locomotive for work in city yards. The chief dimensions are given in the following table:

General Dimensions.

Gage........................4 ft 8½ in
Fuel........................Anthracite coal
Weight in working order........................125,000 lbs
Weight on drivers........................125,000 lbs
Wheel base, driving........................11 ft 6 in
" " rigid........................11 ft 6 in
" " total........................11 ft 6 in

Cylinders.

Diameter of cylinders........................29 in R. H. and 19 in L. H
Stroke of piston........................24 in
Horizontal thickness of piston.......5¾ in. at hub, 4¾ in. at rim
Diameter of piston rod........................3½ in
Kind of piston packing................Plain rings of cast iron
Kind of piston rod packing........................U. S. metallic
Size of steam ports...L. P. R. H. 20x1½ in., H. P. L. H. 18x1½ in
" exhaust " ....L. P. R. H, 20x3 in., H. P. L. H. 18x3 in
" bridges " ....1⅛ in

Valves.

Kind of slide valves................Richardson balanced
Greatest travel of slide valves........................5½ in
Outside lap " " " .....L. P. R. H. ⅝ in., H. P. L. H. 31-32 in
Inside clearance of slide valves..L. P. R. H. 1 16 in., H. P. L. H. ⅛ in
Lead of valves in full gear........................1-16 in
Kind of valve stem packing........................U. S. metallic

Wheels, Etc.

Diameter of driving wheels outside of tire........................51 in
Material " " " centers..............Steeled cast iron
Tire held by........................Shrinkage
Driving box material........................Steeled cast iron

Coal capacity........................3¼ tons
Total wheel base, engine and tender................39 ft 5¼ in
Total length, engine and tender........................52 ft 4⅜ in

The engine is fitted with the Westinghouse American combined brakes on all drivers, tender and for train, magnesia sectional boiler covering, double riveted mud ring, ⅛ in. consolidated muffled and ⅛ in. Ashton blow-back safety valve and central steel brake beams.

PISTON TRAVEL OF BRAKE CYLINDERS.

In the report of the committee on piston travel to the Air Brake Men's Association at the recent convention at Roston, the following table was presented which shows the comparative brake cylinder pressures for various piston travels and train pipe reductions:

Train Pipe Reduction.	Piston Travel and Resultant Cylinder Pressure.							
	4	5	6	7	8	9	10	11
7	25	23	17½	13+	10½	8	Piston entirely	not out.
10	49	43	34	29	23½	19½	17	14
13	57	52	44	37½	33	29	24	20
16			54	47½	41½	35	29	24
19				51	47	40	36½	32
22					50	47½	44	39
25							47	45

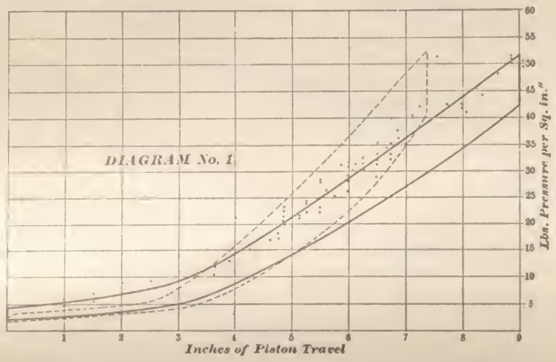
The committee says:

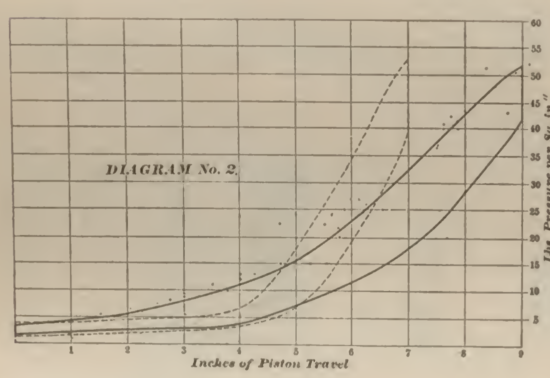
"Comparison with the few figures given by others shows a considerable difference, and, although each cylinder pressure shown is the average of not less than five applications, and the train pipe pressure and reductions were carefully checked up by comparison with a gage on the

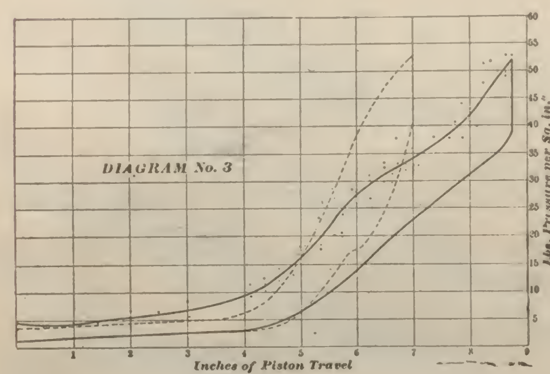
xiliary reservoir, yet it is not felt that the results are infallible; but we believe them to be fairly accurate and of considerable value as a basis of comparison.

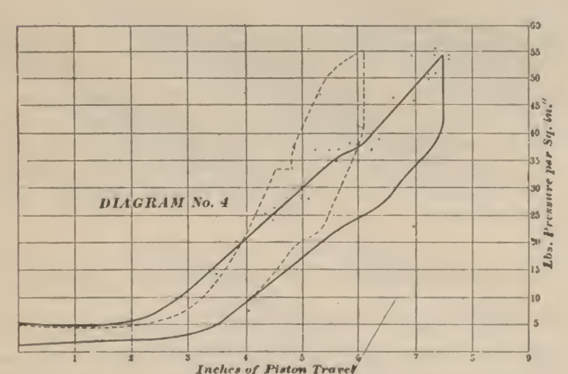
"A close observance of the work done by many good engineers indicates that with brakes in fair condition the average stops are made by such men with reductions of from 10 to 15 pounds. Also, that about the same amounts are required in holding down heavy grades at ordinary speeds. Referring to the table mentioned, it is seen that a 10-pound reduction gives a cylinder pressure of 23¼ pounds with an 8-in. travel, and one of 43 pounds with a 5-in. travel, an increase of nearly 50 per cent."

Diagrams 1 to 4, inclusive, are intended to show the difference between a standing application and others made running with the same adjustment. The broken line is a reproduction of a representative standing card, and the full one is a resultant of many running applications; the terminal pressure, or that where brake was held for an interval between graduations, and the corresponding piston travel being indicated by a dot.









DIAGRAMS OF PISTON TRAVEL.

No. 1 represents the light rigging tested in first series, before referred to. No. 2 is the same rigging with beams trussed, or second series. Nos. 3 and 4 represent the M. C. B. standard brake gear and strong metallic beams used in the third series of tests, No. 3 being with a longer travel than No. 4.

In No. 1 a single point will be noticed very close to the terminal pressure of the standing card. This was the result of a rapid service application at slow speed, the train coming to rest before the usual amount of lost travel obtained running was had.

The following recommendations are made by the committee:

1. That yard tests be made from a 90 lbs. train pipe pressure and a full service application, and piston travel adjustments, based on this, be made 5½ in. for freight and 7 in. for passenger.

2. That road tests be made from not less than 50 lbs. pressure for freight and 60 lbs. for passenger, and that re-adjustments be made to between 5 and 6 in. on freight and 6 and 7 in. on passenger where found less than 4½ in. on freight and 5½ in. on passenger, or where over 8 in. on either.

3. That brake cylinders of such size be employed as recommended in Westinghouse Air Brake Co's. circular of December 1, 1895, that total leverage necessary to employ may not excessive.

4. That brake rigging (including beams) of sufficient strength be employed to reduce deflection to a minimum.

5. That lost travel due to truck construction and wear be reduced as much as possible.

Master Mechanics' Association Circulars.

The secretary of the American Railway Master Mechanics' Association has sent out the following circulars to embers of the association:

Truck Swing Hangers.—1. Do you use swing motion trucks under your locomotives? If so, to facilitate the work of the committee, please send a sketch or drawing showing the length and angle of the swing hangers of each class of locomotives, and also state what is the total and rigid wheel base of locomotives of each class.

A. Eight-wheeled locomotives.
B. Ten-wheeled locomotives.
C. Mogul locomotives.
D. Consolidation locomotives.

2. Please advise the committee what is your opinion as to the necessity of a swing motion truck on each of these different classes of locomotives. The Forney type should be considered under the head of eight-wheeled locomotives.

3. If you have had experience with locomotives of the same class with and without swing motion trucks, have you noticed any difference in the relative wear of the wheel flanges and hubs?

Please send replies as early as possible to G. L. Potter, Pennsylvania Railroad, Fort Wayne, Ind.

Steam Pipe Joints.—Your committee, appointed to report upon "Steam Pipe Joints," to consider the present location and angle of steam and exhaust pipe joints on the cylinder saddle, the action of the cinders and heat upon them, and advise if it would not be beneficial to change their location and angle to overcome one of the troubles now experienced (drawings to be submitted with recommendations), requests that you will co-operate by furnishing, as promptly as possible, any information which you consider of interest in this matter.

The committee suggests the following points to be considered in furnishing data, but it is hoped that members will not confine themselves to answers to these questions. Any other suggestions which will serve as a guide in making up a comprehensive report will be much appreciated.

1. Please furnish blue prints, sketches, or full description of your standard form of steam and exhaust pipe joints.

2. Have you made any experiments upon joints of different forms from your standard, and if so, what results led you to adopt your present standard?

3. Describe the forms you have found defective, stating the weak points which developed.

4. Are your present standards satisfactory?

5. Have you ever tried any material for pipes other than cast iron? If so, with what results?

6. About how often do you have to remove pipes to regrind joints before engine goes to shops for general repairs?

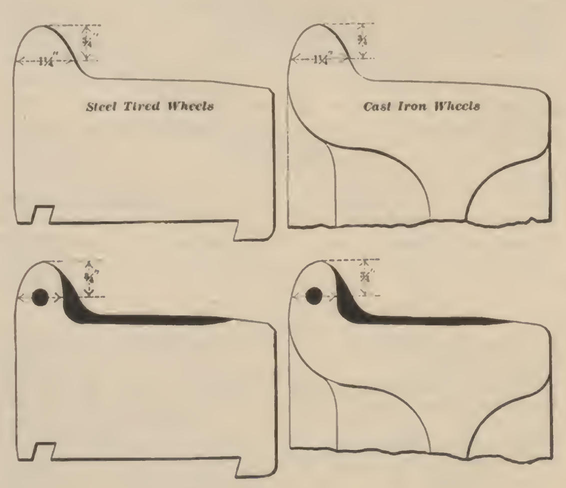
7. What suggestions have you to make in reference to the points mentioned in she sub-heading of the subject under consideration?

In conclusion, your committee especially requests that members will assist by prompt reply to this circular, as the time in which to prepare a report is short.

Please forward replies and drawings to George Gibbs, mechanical engineer, C. M. & St. P. Ry. Co., Milwaukee, Wis.

Engine Truck Wheel Flanges.—The subject upon which we are asked to report at the June convention this year is the "Thickness of Engine Truck Wheel Flanges," the idea being to suggest the minimum thickness at which it is safe to allow the leading truck wheels to run.

Herewith we give drawings representing sections of steel tired and cast iron wheels; the normal sections and also those of wheels in worn condition.



We wish you would give us your ideas as to when you would consider it wise to remove a leading engine truck wheel on account of flange wear. If you can give this information by inserting a dimension in the blank dimension line on the worn wheel section, we wish you would do so. Please note that the flange dimensions should be taken and given at a point ¾ in. from the top of the flange.

You will remember that this matter was brought up at Alexandria Bay. (See pp. 274 and 275 Report of American Railway Master Mechanics' Association for 1895.)

Please address replies to the chairman, Pulaski Leeds, Louisville, & Nashville Railroad, Louisville, Ky.

AIR BRAKE TESTING AND INSPECTING PLANTS.

A special committee of the Central Railway Club appointed to investigate the subject of plants for inspecting and testing air brake apparatus submitted a report of which the following is the substance:

In relation to the character of plants necessary to provide for the proper inspection and test of cars, experience has thus far developed that two 8 in. air brake pumps are of adequate capacity to supply 15,000 lineal feet of 1¼ in. pipe. At a point having an interchange of 600 cars per day this amount of piping has been sufficient without any additional storage reservoirs. This fact is especially mentioned, as it may be of interest in connection with the question of reservoir storage capacity required for testing plants in addition to the pipe-line storage. It has also developed that plants with a less number of feet of pipe require additional reservoir storage to compensate for the decrease storage in pipe line. At one point of this kind with 3,000 ft. of piping three reservoirs of the size in use on locomotives have been found satisfactory, air being supplied with one 8-inch pump. Points where air is used for other purposes than testing brakes a higher pressure has been found necessary in storage reservoirs than 70 lbs., which is used for testing. This increased pressure has been obtained by the use of an air pump supplying a reservoir with air at normal pressure (70 lbs.), and a second pump with the air cylinder end bushed to a smaller diameter, so that with the low speed pressure usually carried on shop boilers the air pressure can be increased to 100 lbs. or more, the supply pipe for testing in this case being provided with a reducing valve to control pressure at 70 lbs.

We would recommend in all air brake plants that an excess pressure of from 20 to 30 lbs. be carried to provide for the decrease in pressure from frequent testing and to insure that test corresponds with a regular train service test.

At points where steam is not available from shops or other boiler plants different methods have been employed. One being to provide a small boiler of 12 horse power to generate steam for running air pump, costing approximately $165. Another plan now in use on a prominent line, which has been adopted on account of its slight expense, is the locating of a large storage reservoir, made of a locomotive boiler, at a convenient point for yard or road engine, which, when not otherwise engaged, are connected to reservoir supplying it with the necessary amount of air for testing a very limited number of cars that would otherwise cause delay to train if not tested until road engine was coupled to train. The idea has been suggested that an efficient and economical arrangement would be to use one of the various air motors, commonly termed wind mills, for operating a pump of economical design for this purpose. The air motor costing approximately, with a 60 ft. steel tower and a 12 ft. steel wheel complete, $125. A special air pump, now manufactured and used in connection with such an air motor for other purposes, having from 8 to 12 in. stroke with from 4 to 6 in. diameter of piston, can be obtained for $35, making a total cost of $160. An air motor and compressor of this description under ordinary conditions is capable of delivering 120 cu. ft. of air per hour at 90 lbs. pressure per square inch, being sufficient for testing from 300 to 400 cars per day. The special features that recommend this arrangement for furnishing compressed air are the exceedingly low cost of installation, slight expense in operation and maintenance, no fuel or regular attendant being required; for these reasons careful consideration should be given this device.

Yard Piping.—The piping should consist of a line of 1¼ in. galvanized iron pipe, located as closely to outside of rail as possible and on top of ties, cut-out cocks with suitable connections being provided at intervals of 36 ft., this distance having been found very satisfactory in yards equipped for the past two years, with the use of hose of convenient length to connect cars in trains on adjoining tracks.

A short piece of air pipe, with standard hose and couplings at each end, has been found preferable to a long hose. To facilitate inspection one line of pipe should be provided for every two tracks. In addition to cut-out cocks for hose connection, each line of pipe should be provided with a cut-out cock, so that in the event of a leak a portion of the line can be cut out for repairs without interfering with entire pipe line. Expansion joints should also be placed at distances of 150 ft. to provide for expansion and contraction. Special attention is called to the arrangement of coupling and cut-out cock. The more common plan consists of a hose and coupling varying from 7 in. to standard length of hose. For this purpose a box has been provided for protecting the parts from the weather, in some cases boxes made of wood, in others cast iron. When the wooden box is used the piping is usually under the ground, the top of box being slightly above level of ground. While this plan is used to some extent your committee finds objections to it, renewals necessary on account of decay and its location with respect to level of ground has resulted in serious trouble owing to water getting into the box and freezing. This has been remedied to an extent by the use of an iron box placed on top of the ties. A further improvement, we think, can be made by the use of plan shown in the attached sketch. [This is a low cast iron box placed upon the ties, containing a cock and hose coupling. The cover over the top and end of the box is removable. A wedge of wood is placed upon each side of the box to protect trainmen from stumbling over it.—Ed.] The special feature of this arrangement is that it avoids the water and offers little or no obstruction on top of tie, as is the case of the iron box referred to above.

Character of Test to be Made.—In interchange yards where air brake plants are located the air brake cars should be charged immediately after placing protection flags in position. The inspection of air brake apparatus should be made at the same time that the general inspection of the train is made. After the inspection is completed a service application should be made to determine that brakes are in proper working order and to adjust piston travel if necessary. In order to obtain a service application, which is essential in making tests, an ordinary ¾-in. or 1-in. cut-out cock, having a 3-16-in. hole drilled through one side of plug and also body of cock, converting it into a three-way cock, should be connected with the

hose used in testing, the test being completed after an examination has been made to insure that all brakes have properly released. The test as described at yard plants when cars are received from other line need not be repeated on the line of the road, further test being made by road engines when trains are made up, excepting cases of cars placed in trains at intermediate stations and which have not received a yard test within a stated period. Cars given the regular yard test should be marked in some manner so that they can readily be distinguished by inspectors at intermediate points from cars that have not been tested. The test as outlined above does not appear necessary at all division terminals where air brake plants are located, but in cases where practicable the air brake cars should be connected to yard pressure, so that in the regular inspection any defects that exist may be detected. In addition to the tests referred to, it is the opinion of your committee that all cars, foreign and home, when in shop or on repair tracks, should have cylinders and triple valve cleaned and oiled, if the work has not been done within the prescribed time, and in all cases brakes must be tested on each car separately, as it has been shown in various discussions on the subject of use and maintenance of air brakes that comparatively slight defects may result in accidents of more than ordinary proportions.

The committee consisted of Messrs. H. C. McCarty, H. F. Ball, J. A. Chubb and J. R. Petrie.

LIQUID FUEL BURNING—HOLDEN SYSTEM.

It is well-known that Mr. James Holden, locomotive superintendent of the Great Eastern Railway of England, is one of the pioneers in the use of liquid fuel upon locomotives, his object in pursuing this of experimenting being to secure more economical operation of locomotives under his charge. The earlier work of Mr. Holden was carried out with a view of retaining the features of the coal burning fire-box and grate in such a way as to permit of the use of either coal or oil according to convenience. It is well-known to those who have followed the subject that this system consists of two burners placed at the entrance of short tubes through the rear water leg of the boiler immediately above the deck, through which the atomized oil is carried into the fire-box. The usual fire brick arch is employed, and also the deflector over the fire door, and to change from oil to coal burning, it is necessary merely to close these two openings and place the coal fire upon the grates. The oil is carried in tanks upon the tenders of the locomotives. The jets at the atomizers are formed b steam pressure. While the system is called oil burning, it should be stated that the oil is frequently in the form of coal tar or other thick residues of the process of refining petroleum.

HOLDEN'S OIL BURNING LOCOMOTIVE—GREAT EASTERN RAILWAY.

The usual practice in working Mr. Holden's system, until recently, was to keep the grates covered to a depth of about 3 in. with solid fuel which was employed in the form of coal, coke breeze, or a mixture of solid fuels, the combustion of which was retarded by withholding the amount of air from the fire which would be required for rapid combustion. With a supply of coal as well as oil on the tender, the gradations from a small coal fire and a large one with the oil down to a sufficiently large coal fire to run the locomotive and the complete extinction of the oil fire could be made. The apparatus employed and comparative cost of oil and coal as determined by Mr. Holden will be found in the Railway Review of Sept. 10, 1892, and Dec. 29, 1894. Comments have from time to time been made upon the employment of liquid fuel in this country, and the opinion expressed that the principle has a field for application wherever the comparative cost of coal and oil would make oil the more economical. It is also applicable in special cases where regardless of cost of oil, the smoke from coal burning locomotives renders them objectionable, for instance in switching operations in large cities. In this connection, it may be stated that the Chicago & Northwestern is now equipping a switch engine for burning oil in Chicago. There is now no question as to the necessary volumes of heat being obtainable from oil and success has been attained with it in the experiments which are now being made by the committee on exhaust nozzles and steam passages, which is to report at the next convention of the American Railway Master Mechanics' Association. Oil fuel was selected for this work because of the uniform conditions in the fire-box which could be obtained with it and were impossible with coal. Mr. Holden, in response to an inquiry, has sent the following communication:

"Regarding our engines on the Great Eastern Railway, there has been no great departure from the practice illustrated and described in your journal some time ago, except in the case of three engines, which I am firing entirely with liquid fuel. Two of these are express engines, and I am sending you a photograph of one of them G. E. R. 712 (illustrated herewith.) This engine had been running since May, 1895, burning nothing but oil fuel. It has 133 "Serve" tubes, 2¼ in. outside diameter giving 993 sq. ft. of tube heating surface against 1,116 sq. ft. for the 254 plain tubes 1⅝ in. outside diameter in the ordinary engine of the same class, but although the external area is considerably reduced the gills act as retarders to the passage of the gases, and also going down into the hitherto untouched strata of the incandescent gases, they act as collectors and transmitters of heat, the net result being a practical increase of steam generating power and the reduction of the temperature of the effluent gases.

"The cylinders are 18 x 24 in. and the driving wheels 7 ft. in diameter. The boiler pressure is 140 lbs. per sq. in. The consumption of oil fuel on this engine has been 18 lbs. per mile with a weekly running of over 1,000 miles, and trains averaging 200 tons exclusive of engine and tender. The burners are partly fed with hot air for combustion, the air entering through a series of gilled cast iron heaters placed around the smoke-box. The fuel is carried in cylindrical tanks on the tender with a total capacity of 650 gallons. Competing engines burning coal use 34 lbs. to 35 lbs. per mile on smilar work. The total number of engines running on the Great Eastern Railway using oil fuel is at present 25 and 15 boilers, and furnaces are also fitted for it in the shops here. The residues I am using are unfortunately somewhat limited in quantity, and until a satisfactory importation of foreign petroleum residues takes place I am afraid I shall not be able to make any extensive additions."

A photograph of an exceedingly handsome dining car train hauled by one of Mr. Holden's locomotives has also been received, but is not illustrated here. In the Railway Review of January 18 of the current volume an account was given of the experience with liquid fuel upon the Los Angeles terminal railway which is thought to be the most extensive application in this country, and the success there of Mr. Holden's system seems sufficient to warrant the prediction that it will find more extensive employment in this country wherever the conditions are favorable.

STEEL UNDERFRAMES FOR FREIGHT CARS.

The following was contributed by Mr. D. L. Barnes to the discussion on large freight cars at the meeting of the New York Railroad Club held February 20, 1896.

In taking up work for several car companies I have individually reached the following conclusions:

First. No M. C. B. standard of details of the woodwork of cars will ever be agreed upon.

Second. When steel underframes are introduced the difficulty of obtaining material for construction and repairs will compel the use of standard shapes and lengths of rolled sections. This has been the outcome of the use of rolled metal in buildings, and a plan is now on foot to reduce the number of sections to only one-third of those now used by builders. It is expected in this way that quick deliveries for repairs can be made. There is not the same reasons for standard sizes in wood, as if the wood is large enough it can always be reduced to the desired size.

Third. The hight of cars will not be increased much above the dimensions of the 60,000 lb. freight car on the Burlington road. This car is as high as is safe for trainmen, and the sills have been lowered until they occupy the place formerly taken by the draft sills. This gives the maximum interior hight that may be expected. This car also has the maximum practical width for safety to trainmen and for clearances in tunnels. The width might be increased slightly.

(For dimensions of car see the Railway Review of January 25, 1896).

Fourth. The length of cars for general service will not be increased much. Special service will require longer cars, but it is not believed that any standard car would be longer than the 36 ft. car now used. There will be no difficulty in getting an agreement on the length of cars for ordinary service.

Fifth. In regard to the carrying capacity, the wide variation now common will disappear when steel underframes are used, for the reason that such cars will carry a load of 100,000 lbs. with a greater margin of safety than the present 60,000 lbs. cars carry their rated loads. One advantage that will arise from steel under-frames is that so far as the frame of the cars is concerned the load will not matter. The limitation to the loading will be found in the trucks. The large manufacturers of rolled sections are getting ready to enter the field of car construction with a rolled steel under-frame and a wood superstructure that will not cost any more than the present wooden cars. There will be a saving of weight of about 3,000 lbs. per car, and the running repairs will be very much less, as the under-frames form a continuous draft gear of the best sort. The difficulty of repairs from wrecks of steel under-frames may, and undoubtedly will, be much increased, but as only a small percentage of the total freight car repairs arise from wrecks it is not considered logical that freight car construction should be devised to reduce the repairs from wrecks, but should be devised to reduce the running repairs.

Sixth. There is a decided tendency towards an all metal truck and larger journals. Trucks entirely of metal have not in all cases given satisfaction, particularly those of the Diamond frame type. This arises from the fact that the joint between the transoms and the side frames have been inadequate and they got loose. Enough experience has been had, however, to show that some types of all metal trucks require less repairs than a composite truck, and there is reason to believe that the all metal truck is the truck of the future. When trucks of that kind are properly made, the running repairs will be very much smaller. It is generally believed that such trucks can be built for the same price as the common form of Diamond truck with the composite bolsters.

Seventh. Owing to the increased weight of truck frames and the wear of the joints of the brake gear, there is a general feeling among railroad men that there should be springs placed directly over the axle boxes and these springs should have sufficient capacity not to close under the oscillation of the heaviest load they receive. There might be other springs in the bolster. I am of the opinion that the small cracks that appear at the inner neck of the journals frequently arise from blows received from the closing of the springs when passing over rough tracks. These cracks spread until the journal breaks off.

The Western Society of Engineers.

A paper entitled "Foundations" by Mr. George E. Thomas, will be read before the Western Society of Engineers at the meeting which is to be held at the rooms of the society, 1737 the Monadnock Block, Chicago, on the evening of May 6, 1896. The secretary announces that the rooms and library are now open continuously from 8:30 a. m. to 9 p. m., except Saturdays, when they are closed at 3 p. m. Over 150 exchanges are regularly received, and are on file in the reading room. A full list of these will be printed in the next number of the society's journal, or may be had on application to the secretary.

A quarterly dividend of two dollars per share from net earnings was declared by Pullman's Palace Car Co., April 20, payable on and after May 15, to stockholders of record at close of business May 1, 1896. Transfer books close May 1 and reopen May 16, 1896.

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There is a strong protesting spirit beneath the surface against the comparatively high range of prices established by the iron interests from coke and coal and ore, up. Among producers the feeling exists that the present prices are as low as can be expected Just now, many consumers who desire to place orders, are waiting. Railway managers are not giving out orders with anticipated briskness. Locomotive builders, while busier than a year ago, have still room for more work. Many car builders are doing very little. Bridge builders have not started out with the promised amount of work. In view of these and some other conditions that might be named, buyers of material do not altogether accept the assumption that prices for the rest of the year are unalterably fixed.

Since the recent decision of the supreme court concerning the giving of testimony, a good deal of balderdash has been indulged in as to the instructions given by railroad officials to their subordinates in regard to the necessity of maintaining rates. The impression given by these statements is to the effect that the subordinates were altogether responsible for the demoralization that have heretofore existed and that henceforth these men would have to pay the penalty of their own misdeeds. It may be just as well to have it understood that this idea is the veriest nonsense. No subordinate official makes rates nowadays without full authority from his superior officer, and all such talk as is indulged in by the officials referred to, is simply for effect. Every variation from tariff requires the "O. K." of the ranking official before the difference in rate can be either accepted or refunded, as the case may be. In fact on nearly all railroads the O. K. is required before it can be issued. The subordinate official has sins enough to answer for. To his influence may be traced much of rate demoralization which exists, but for the final acceptance of the rate a higher authority is responsible.

The passage by the New York legislature and the signing by the governor of a bill providing for the transportation of bicycles as baggage has greatly encouraged the advocates of this plan throughout the country. With the precedent set by New York, it will probably not be difficult to obtain the passage of similar bills in other states, although upon what theory bicycles can be classed as baggage, is difficult to conjecture. Nor is it any easier to suggest a plan for the safe and convenient transportation of wheels without the employment of an extra car. It does not appear that overhead hooks will answer the purpose, unless the cars are built much higher than at present, for a very few bicycles thus suspended in a car would utterly prevent the successful handling of ordinary baggage. Not long since, sixteen wheels were observed in a single baggage car of a through train on which the run of ordinary baggage was very heavy. The wheels were placed in the forward end of the car, and the baggage, piled almost to the roof, occupied nearly all the remaining space. Is did not a railroad man to appreciate the force of an observation by the baggage man to the effect that "That would make a nice mess if the engineer should put on the emergency." In view of the delicate construction of the bicycle and its extreme liability to injury, it is neither justice nor common sense to require railroads to transport them unprotected. The question of free transportation is not the chief one. If bicycles are baggage, they should be required to be put into trunks the same as any other baggage, or at least created so that some protection may be afforded.

OPPRESSIVE LAWS.

In a recent interview, Mr. George Gould is reported to have said:

What we need is some legislation looking to the relief of the railroads. Two-thirds of the railroads of the country are either in the hands of receivers or have recently been reorganized and are trying it again. I attribute this bankruptcy of the railroads of the country almost entirely to the operations of the interstate commerce law. That law has paralyzed the railroads, and they will never prosper again until it is repealed, nor will you see any more railroad building while that law is in effect. The laws are too oppressive on invested capital. The repeal of the interstate commerce law, for instance, would help the country amazingly by permitting existing roads to prosper, and by encouraging the building of other roads. This would throw life into the railroads and other collateral industries at once.

If a suggestion may be permitted it would be that Mr. Gould could study the interstate commerce law to advantage. It is not impossible that much of the present embarrassment among the railroads is due to the peculiar operations of the roads in the endeavor to evade the law, but that is a very different thing from the operations of the law itself, and it is scarcely fair to condemn the law for results that might have been almost wholly prevented by a strict observance of the law.

The act to regulate commerce, although designed primarily to restrain the railroads from their alleged oppression of the people, is of much wider scope than was anticipated. Properly construed and faithfully carried out, it may be made to conserve the interests of the railroads fully as much as those of the people. Indeed it is safe to say that, as a means of reducing rates it is practically a failure. In fact if allowed to operate to the fullest extent, nothing could be better designed to maintain rates than the law which is thus decried by Mr. Gould.

The gentleman in question is correct in saying that we need "some legislation looking to the relief of railroads," and that "the laws are too oppressive on invested capital." The relief most needed by railroads is freedom from speculative management and the prevention of illegitimate and dishonest competition; while the laws that need to be repealed are those of the states rather than of the the United States. The divorcement of Wall street from all control in the operation of railroads would go far towards providing the necessary relief in one direction and the adoption by the roads of a more concilitory policy with their patrons would soon have the effect of changing the trend of legislation in the other. But so long as fortunes can be made through the operation of construction companies, reorganization committees and stock deals, there is but little hope for any improvement in the first named particular. Fortunately, however, managers are slowly learning the lesson that the interests of the railroads and the communities they serve are identical, and in this may be discerned the promise of better times.

PISTON TRAVEL OF AIR BRAKES.

In the convention of the Association of Railroad Air Brake Men in 1885, there was a diversity of opinion as to the most suitable limit for piston travel upon freight and passenger cars, and the view which is entitled to the most weight was that too short rather than too long a travel should be maintained. The question was raised with particular reference to mountain work where for special reasons brakes should be up to their maximum efficiency. The short travel gives more power to the brakes and yet the power alone is not the only important item in determining the travel. There is an economy of air to be obtained by short travel due to the small volume of air required to fill the cylinders yet there is an objection to too short a travel because the power of the brakes is increased with the short travel leading to the necessity of releasing and re-applying them several times to do the work which might be performed by a longer application with a somewhat greater travel. The frequent recharging with a short travel will waste more air than the larger volume of air used in the cylinders which slightly greater travel would consume. The chief advantages of a short travel, which is not too short, are the possibility of quick application and release, high cylinder pressure, and comparatively small consumption of air, as is shown by Mr. F. B. Farmer in a paper read before the Northwest Railway Club in 1894, which will be found in the Railway Review of February 2, 1895. These features result in quicker stops because of the quicker development of the cylinder pressure, also as less air is withdrawn from the reservoir for each application, recharging is more quickly accomplished and more reserve power is provided, which means additional safety, and this is especially desirable upon mountain roads. Mr. Farmer recommended in the paper referred to that the minimum travel for freight cars should be four inches, and for passenger cars, six inches.

A valuable addition to work in this direction appears in the form of a report by a committee of which Mr. Farmer was chairman, which was presented at the convention of the Air Brake Men's Association in Boston last week. The chief object of the committee was to determine the maximum and minimum travel of brake pistons and the subject was treated systematically and thoroughly. First the relation between the piston travel and the cylinder pressure was taken up and the table presented which appears elsewhere in this issue, showing the resultant cylinder pressure for different amounts of train pipe reduction and different amounts of piston travel. It was shown that a difference of nearly fifty per cent existed between a ten pound reduction with an eight inch travel and the same reduction with a five inch travel. The committee showed that a twenty-one pound reduction with a nine inch travel gave forty-three pounds cylinder pressure, and that a ten pound reduction would give the same result with a five inch travel. Then placing the number of stops on one of the northwest Pacific Coast roads at one hundred seventy-five, it was estimated that on a thirty car fast freight train, the difference in free air employed would be 8,736,000 cubic inches, and this would require about three and a quarter hours pumping with an eight inch pump and about two hours pumping with a nine and one-half inch pump, the steam pressure being one hundred forty pounds, in order to compress it to ninety pounds pressure. The committee states that this is not an overdrawn case and it would appear to be indicative of a means of making a perceptible saving along with other advantages which might be gained by using a shorter travel.

Three series of tests were made by this committee upon a coach on the St. Paul & Duluth Railroad, the first employing white oak brake beams four by four inches at the ends and seven inches deep at the center; the second series was made with new brake beams of the same dimensions but with a truss seven inches deep of five-eighths inch rods; the third series was made with M. C. B. brake rigging and metallic beams. In this last series more deflection was found with the metallic than with the trussed oak beams and a stiffer metallic beam was substituted. The coach was fitted with a Thompson indicator using a fifty-pound spring with a ratio of two and one-half to one, between the travel of the piston and that of the card. A great deal of attention was paid in the tests to the amount of lost travel which is defined as the travel which produces no proportionate clearance of the shoes in the release of the brakes. This is clear loss through waste of air and unnecessary brake shoe wear. Its cause is found in deflection in the levers and lost motion in the connections, which also includes the looseness of pedestals, boxes, brasses, transoms and center bearings. It was clearly shown that the losses were increased in running, over those of standing tests, which is to be attributed to the jarring of the gear while running. A difference of from one inch to one and one-half inches existed between the travel for standing and running tests.

Fifteen cards were taken in three sets to show the amount of the average cylinder pressure for thirty running applications, showing that the increase of piston travel by using light levers, rods and pins with wooden trussed beams over that obtained by M. C. B. levers, rods and pins and a good metallic beam, was forty and one-half per cent. With the same light gear and untrussed beams, the average travel was increased one hundred ten and eight-tenths per cent. The large amount of difference between the deflections standing and running, is due to lost motion in pedestals, boxes, brasses, center bearings and truck transoms and herein is a reason for car construction and repair men to consider whether all of it is necessary.

A full service application is recommended upon which to base adjustments in making yard tests. The conclusion as to the adjustment is that the limit should be between five and eight inches on freight cars and between six and eight inches on passenger cars. This is undoubtedly better than the extremely small travel previously recommended by Mr. Farmer and for the reason already stated. The work of the committee is interesting with regard to the comparison between metallic and wooden brake beams, and

it is likely that those roads which have gone back to the wooden beams in the hope of obtaining an advantage from the low first cost, will find that there are subsequent charges for the pumping of air and for unnecessary wear of the rigging, and also of the entire running gear of trains, that should be given consideration beside the element of first cost. Diagrams by the committee, together with the table of pressures referred to, will be found elsewhere in this issue.

RIBBED TUBES FOR LOCOMOTIVES.

The recent debates upon locomotive grates have brought many interesting and valuable points, and while perhaps no positive tangible result has been accomplished, the discussion has succeeded in calling attention to the fact that the power of a locomotive upon the road is determined chiefly by the capacity of the boiler. The subject of heating surface of a locomotive is much too large to be covered in a brief article, and one phase only will be treated here, namely, the tube heating surface. It might be said that the problem of the efficient use of fuel cannot be confined to any one item of design such as the heat producing or heat absorbing departments which are represented by the grates and the heating surface. One cannot be treated alone, but inasmuch as all the heat developed upon the grates should be absorbed by the heating surface in order to get theoretically perfect use of fuel, it is obvious that the heating surface requires as much attention, if not more, than the grates.

A good rule to follow is to get as much heating surface as possible, and there is excellent authority in the results of past experience for believing that, with the locomotive boiler, it will be difficult, if not impossible, to get too much. However, "heating surface in the abstract is one thing; its efficiency is another." The heating surface of a tubular boiler may be increased by lengthening the tubes or adding to their number, but too many tubes crowded in for this purpose without regard to the other conditions of steam raising is known to be the means of decreasing efficiency by interfering with circulation, whereas, lengthening them beyond a certain limit does not avail to get more heat from the gases. The upper half of a circular fire tube is much more effective than the lower half; and, except from the radiating effect, it is probable that no heat gets to the water from the lower portion, which may therefore be considered as worthless. There are certain waves caused by convection in the gases as they pass through a smooth horizontal tube, but beyond this there is believed to be no movement of the gases except one of translation. And as the office of a tube is to extract as much heat as possible from the gases it would seem that a smooth tube was illy fitted for the purpose. Tubes are capable of giving more heat to the water than they get out of the gases. And heating surface, in order to be effective, should be so arranged as to cause the gases to come in direct contact with the metal by either suddenly changing the direction of their current, or placing obstructions in their path, which may be used for conducting more of the heat from the gases to the water.

With this in view, it has been suggested that the tubes should be corrugated, or else that they be fitted with fins extending inwardly from the body of the tube of which they form an integral part, the object being to stir up the gases and break up the currents into eddies in such a way as to lead to bringing the whole body of the gases at some time into contact with the metal or to reach down into the gases in order to get at the inside of the stream. One of the best arrangements for accomplishing this purpose seems to be in the employment of the form which is well known under the name of the "Serve" ribbed tube, to the advantages of which attention is called by a communication which appears elsewhere in this issue. It is believed by many that the limit of the capacity and efficiency of locomotive boilers has been nearly approached, if not reached, unless the heating surface is increased, and the success which has been obtained by the employment of ribbed tubes in foreign railway and marine practice, is evidence that the smooth tubes have been justly criticised. The results which have been published so far as can be ascertained are all favorable to this method of increasing heating surface, and from this standpoint it seems remarkably strange that so little has been done in this direction in this country. For tests which have been made here with these tubes, the reader is referred to the RAILWAY REVIEW of May 9, 1891, page 302, which records the results of the experiments by Mr. H. B. Roelker, upon a stationary boiler at Elizabethport, N. J. These tests covered twelve days, six days being devoted to plain and six to ribbed tubes, and the result shown for natural draft was a gain in economy of coal of nearly thirty-one per cent. In the RAILWAY REVIEW of April 13, 1889, the records of a series of tests are given which were made by the French government at Brest, in 1888. These tests were made by first noting the performance of plain tubes and then by replacing them with a ribbed set and repeating the trial. The average gain of efficiency was put at twenty per cent in favor of the ribbed tubes on a basis of evaporation of water per pound of coal.

These experiments were exhaustive and it would seem also conclusive as regards horizontal stationary boilers. Elsewhere in this issue will be noticed a reference to the experience of Mr. James Holden, locomotive superintendent of the Great Eastern Railway, England, with these ribs in the tubes of the oil burning locomotives, in which he states that a practical increase of steam generating power is obtained with 993 square feet of heating surface from 163 two and one-quarter inch "Serve" tubes as against 1,116 square feet obtained by 254 plain tubes one and five-eighths inches outside diameter. M. Ch. Baudry, superintendent of motive power of the Paris, Lyons & Mediterranean Railway, in 1892 built a number of four-cylinder compound engines, which were illustrated in the RAILWAY REVIEW of January 27, 1894, and in connection with this design, a series of interesting experiments was made with a view of determining the value of these tubes, the object of the test being to determine the effect of the tubes on the efficiency of the boiler and to ascertain whether the reduction of weight due to shortening the tubes would be satisfactory. The length of the tubes was made nine feet, ten and three-eighths inches, which was found to be the most efficient for the service on that road as against fourteen feet for plain tubes, which was believed to express the comparative difference in value of the two forms in practical service.

In a recent issue of the current volume *Revue Generale des Chemins de Fer* is a description of one of a lot of forty locomotives which have just been constructed upon the designs of M. Baudry for the same road, and in which the length of tubes and their number have not been changed from the earlier design. This road is now using these tubes exclusively, and it is reported that their advantage in practice is twenty per cent over the smooth tubes. The statement is also made although it cannot be verified at this time, that there is but one railway in France which is not using them. In this connection the following quotation from the report by M. Ed. Sauvage, before the International Railway Congress of last year is appropos "ribbed boiler tubes reach their maximum evaporative efficiency at much shorter lengths than the plain tubes from six and one-half to eight and one-quarter feet. It appears from a comparison of results of the different experiments, that the ribbed tubes give the same efficiency as the plain tubes as well as the same consumption of fuel, for a much shorter length of boiler, thus greatly reducing the weight of the whole. The boilers supplied with these tubes have given satisfaction in service. In applying these tubes to existing boilers, the same evaporate efficiency and a smaller consumption of fuel was obtainable, the draft remaining the same." * * * * * * * *

To sum the matter up, the fins or gills on the inside of the tubes give an improvement of about twenty per cent in marine and locomotive practice abroad; they have given more than this in stationary tests in this country and allowing that but one-half as good results can be obtained in locomotive practice, it would seem that they are abundantly worth a trial, and there is no reason for believing that the advantage in locomotive work will be any less than that which has been obtained in the other practice. If French engineers are able to save this proportion of the cost of fuel, and at the same time reduce the weight of their locomotives by 12,300 pounds, as has been done upon the Paris, Lyons & Mediterranean Railway, the engineers of this country can certainly afford to practically investigate the subject, and they owe it to their profession to do so.

The Western Railway Club.

The April meeting of the Western Railway Club was held in the Auditorium Hotel, Chicago, on the afternoon of the 21t instant, President Potter in the chair. The recommendations by Mr. Pulaski Leeds, which were presented at the March meeting, with reference to the loading of lumber, were acted upon by a committee and it was decided to refer the matter to the M. C. B. Association through the committee on standards. The question of indexing the proceedings of the club upon the lines followed by the American Society of Mechanical Engineers and the American Institute of Mining Engineers, was brought up by Mr. F. A. Delano, and it was voted to have this done in connection with the work of indexing, which is now in progress. Mr. J. F. Deems of the C. B. & Q. R. R. then described some tests which he had made to determine the form of the exhaust jet in the stack of a running locomotive, and some interesting information was presented which will be placed before our readers later. This discussion was participated in by a number of members. A topical discussion upon the pooling of engines was then held, in which it was found that there were firm adherents to the method of pooling, and also that by which engines were assigned as far as possible to regular crews. A paper entitled "Railroad Ethics" was read by Mr. H. D. Judson of the C. B. & Q. R. R., and also one entitled "Locomotive Rating and Fuel," by Mr. Tracy Lyon of the Chicago Great Western Railway.

Engineers' Club of St. Louis.

A regular meeting of the Engineers' Club of St. Louis was held April 15, 1896. It was ordered that the thanks of the club be extended to Mr. Estill McHenry for presenting to the club a number of very valuable photographs, maps and drawings, formerly belonging to the late Capt. James B. Eads. It was also ordered that the secretary express in a formal letter to Mr. McHenry, the club's appreciation of the donation. Ordered also that proper acknowledgement be made to Col. E. D. Meier for donations of the back proceedings of the American Institute of Mining Engineers.

On motion it was ordered that a committee of three, of which the president be chairman, be appointed to co-operate with the local members of the American Society of Mechanical Engineers, for the entertainment of their coming convention—the members of this committee not to be members of the American Society of Mechanical Engineers.

Mr. Carl Gayler read a paper on "Highway Bridges." He reviewed briefly the movements in the direction of reform which had heretofore taken place, particularly the agitation of 1890, and gave his views as to why those movements had accomplished so little. He explained a typical case of highway bridge design, and described an accident to the Broadway bridge over the River Des Peres, in South St. Louis, where a contracted water way had resulted in scouring out a deeper channel, and undermining one of the abutments. He thought it proper in designing highway bridges, to use lower unit strains than is customary for railroad bridges, rather than higher, as is the general practice. In general, railway bridge practice could, in his opinion, be followed to advantage in highway work. He also discussed lateral top bracing, painting and inspection.

Messrs. Eayrs, J. B. Johnson, Pitzman, Crosby, French, Russell and Baier participated in the discussion.

International Car Accountants' Association.

The secretary of the International Association of Car Accountants writes that the annual meeting at Cleveland promises to be very interesting. Papers have been promised on the following subjects: "Law of Copyright on Railroad Blanks," S. H. Church, Pennsylvania Company; "Reminiscences of the Past," C.W.Cushman, Railway Car Association; "Work of the Treasurer, Past and Present," J. W. Burnham, Fitchburg Railroad; "Light, Weighing, and Stenciling Freight Cars," T. S. Bell, Pennsylvania Railroad; "Our Association, Past, Present and Future," J. R. Cavanaugh, Cleveland, Cincinnati, Chicago & St. Louis Railroad; "Matters in General," A. B.Wilmer, Mobile & Ohio Railroad; "Distribution and Handling of Foreign Equipment," W. E. Beecham, Chicago, Milwaukee & St. Paul Railroad. The following topics for discussion have also been suggested: "The advisability of a universal system of numbering railroads for recording interchange movement of cars on foreign lines, and showing number delivering lines on junction cars," and "The relation of small roads or feeders to trunk or through lines."

CANTILEVER BRIDGES.

At the meeting of the Engineers' Club of Philadelphia, April 4, a paper on "Cantilever Bridges" was read by Prof. Edgar Marburg, of which the following is a brief abstract:

The origin of the word cantilever is somewhat obscure. In modern engineering a cantilever, strictly speaking, denotes a girder fixed at one end and otherwise unsupported. For convenience the collective term "cantilever bridge" is applied to a structure of which a cantilever proper forms a component part.

The first iron bridges of this type were built in 1876, although their advantages, under certain conditions, had been recognized at an earlier period.

Among the cantilever bridges proposed at this time the most noteworthy are the six-track Hudson river bridge at New York, 2,300 feet span between centers of towers; the Detroit river bridge at Detroit, 1,130 feet span; the Mississippi river bridge at New Orleans, 1,058 feet span: and the New York and Long Island bridge at New York, including two 850 feet spans.

The cantilever type of bridge seems destined to occupy a field intermediate between that held by the simple truss for moderate span lengths and that which will probably be covered by some form of suspension system for spans above 1,500 or 2,000 feet.

In the paper attention was directed more especially to the comparative merits of cantilever and non-continuous trusses and to the conditions affecting their relative cost. Certain general questions relating to the economic designing of cantilever bridges were also treated in some detail.

The conclusions briefly summarized are as follows:

For moderate span lengths, cantilever bridges are, under ordinary conditions, uneconomical compared with non-continuous ones, owing to (*a*) increase weight of anchor trusses and (*b*) added cost of shore anchorages in cantilever bridges of the Niagara type.

These advantages are balanced in part by the following favorable features: (*a*) decreased weight of trusses in the cantilever arms and suspended span, as compared with

simple trusses equal to their aggregate length; (b) decreased cost of erection.

For moderate span lengths a net comparison will show an economic advantage in favor of simple trusses, unless local conditions are such that the construction of false works would be attended by extraordinary expense.

With increasing span lengths certain advantageous features of the cantilever system become more emphasized until a limit is reached, beyond which well designed bridges of this type are more economical than simple trusses with the same arrangement of piers, aside from advantages incidental to their method of erection.

Theoretic investigations as to the most favorable location of piers for cantilever bridges are of little practical value, first, because their position is determined usually by considerations affecting mainly the cost of the substructure and the requirements of navigation, and, secondly, because it is not possibly to properly include all the essential elements of the problem in a general theoretic treatment. Assumptions must be made which practically vitiate the value of the conclusions.

A theoretic analysis limited to the determination of the least weight length-ratio of the suspended span to the total span, involves fewer complications, although in this case also the conclusions are influenced to some extent, not definitely determinable, by the relative distances between piers, and by other circumstances. The result reached by the author was that this length-ratio was not less than one-half and usually more nearly two-thirds.

The advantages of the cantilever system for long spans, as compared with simple trusses are:

1. Lower economic depth of trusses.
2. More favorable distribution of the dead load.
3. More favorable distribution of the wind forces.
4. Decreased wind stresses from causes other than their more favorable distribution.
5. Lower requirements for width, center to center of trusses, resulting in (a) saving in cost of substructure, and (b) saving in weight of floor system and lateral bracing.
6. Saving in cost of erection, usually greater, relatively, than in the case of short spans.
7. The prevention of obstruction to the main channel during construction, especially important at situations where long spans are required.

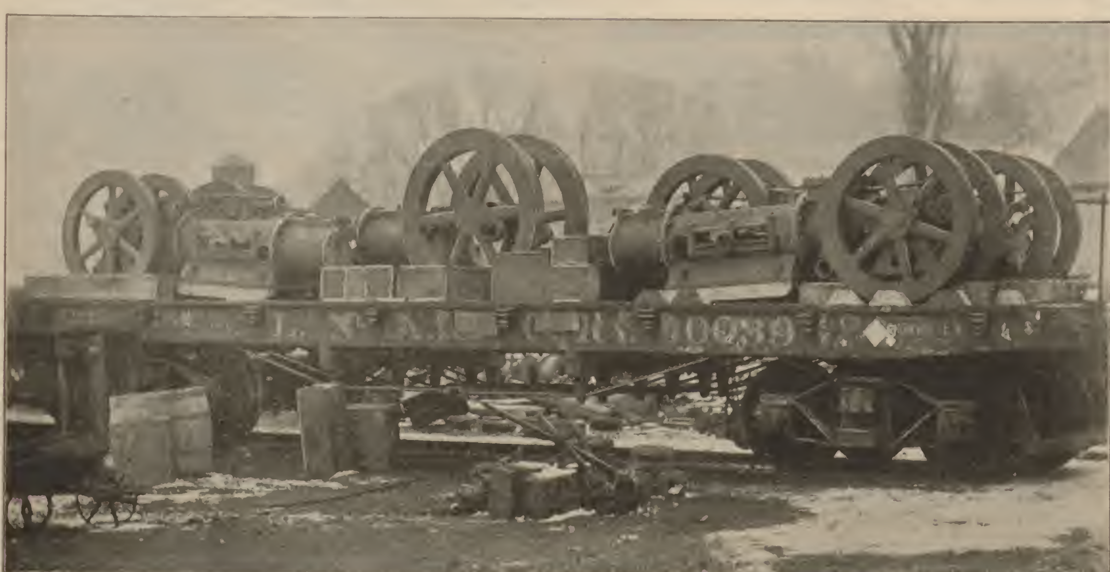
For short spans the use of cantilever bridges is not advisable on account of their excessive deflection, aside from their lack of economy. Every precaution should be taken in such cases, especially for highway bridges, to reduce the deflection and vibration to a minimum; (a) by using a liberal depth of truss; (b) a liberal length-ratio for the suspended span; (c) by avoiding the use of adjustable counters and flexible secondary members; (d) by providing a rigid system of diagonal and lateral bracing, particularly the former; (e) by riveting the stringers between the floor beams and the latter to the posts, and by employing, if possible, a solid metal floor system, with concrete bedding.

In the discussion Mr. James Christie called attention to the fact that while Professor Marburg had not mentioned Sedley, the English engineer, his name should be connected with cantilever bridges, as he was one of the earliest engineers to put them into systematic shape. Twenty-five or thirty years ago he built several important bridges of this type, which was at the same time named the "Sedley system."

There is a little bridge in Philadelphia, over the Pennsylvania Railroad at Fortieth street, built in 1876, that is mechanically something between the cantilever and suspension types, but it is worthy of notice as being among the early bridges of this class.

AIR COMPRESSORS ON THE SANTA FE RY.

The accompanying illustration is reproduced from a photograph of a car load of Rand air compressors recently shipped by the Rand Drill Co. to the Atchison, Topeka & Santa Fe Railway. There are six machines in all, five of them being 12 x 16 in. and one a 14 x 22 in. They will be installed at different points along the line of the railway for use in driving tools about the shops. The main shops at Topeka are thoroughly equipped with air, and it is stated that over five miles of pipe is used in conveying it from point to point. The air compressor used at this point was fully described in the issue of the RAILWAY REVIEW of Jan. 25, 1896, on page 45, and following is a list of the tools and machines now being operated by air in this shop alone:



SHIPMENT OF RAND COMPRESSORS TO THE A. T. & S. F. RAILWAY

1 Baird 10 ft. reach stationary riveting machine, including pneumatic hoist and crane.
1 Baird 6 ft. reach stationary riveting machine with pneumatic crane.
1 Baird combination flange punch and riveting machine.
2 Baird truck riveters.
1 bridge and girder riveter.
1 frame riveter.
1 stay bolt breaker.
1 tank riveter.
1 mud ring riveter.
1 stay bolt cutter.
25 rotary tapping and drilling machines.
4 rotary reaming machines.
1 rotary grinder.
1 rotary saw.
6 pneumatic hammers.
1 punch.
1 angle iron shears.
1 crown bar bolt machine.
3 hammers in blacksmith shop.
1 large punch and shears.
1 bulldozer or forming machine in blacksmith shop.
1 rail saw.
1 rail drill.
1 device for operating transfer table.
2 rail benders.
1 tin shop stamping machine.
1 device for revolving driving wheels for setting valves.
1 device for shearing bolts.
30 hoists in shop.
3 10 ft. hoists for loading and unloading car and driving wheels, cylinders, etc.
1 device for loading and unloading oil at store house.
1 steam and exhaust port milling machine.
3 letter presses.
6 jacks for pulling down car draft sills.
1 device for fitting up hose couplings.
3 pneumatic painting machines.
1 machine for tearing down old car roofs.
12 jacks for raising and lowering freight and passenger cars.
1 drop pit.
1 device for sanding engines.
1 device for extracting oil from old waste and packing.
1 shifter for switching engines and cars through shop yards.
4 Brotherhood engines.
1 device for making washers.
1 device for securing boiler sheets at flange fire.
3 rivet holders.
1 device for cleaning coach cushions.
2 draw bar jacks.
2 devices for rolling flues.
3 paint burners.
1 whitewashing machine.
8 water pumps.
1 device for handling work in brass foundry.
1 device for operating turn tables.

Compressed air is also used for operating fans, testing air brakes, cleaning flues, cleaning the shops and engines, running engines from erecting into paint shop. Illustrated descriptions of several of these interesting machines will be presented in these columns in the near future.

A NEW BRAKE SHOE BY THE SARGENT COMPANY.

The Sargent Company, of 675 the Old Colony building, Chicago, has just put upon the market a new combination brake shoe for coach wheels which is believed to be an improvement upon former designs. This shoe is illustrated in the accompanying engraving wherein it will appear that the crucible cast steel pieces have been retained upon the portion of the shoe which bears on the outside of the tire which does not come in contact with the rails, and in addition to this, four spots are chilled upon the opposite side of the shoe which bears upon the throat of the wheel flange. This combination shoe is the result of the wide experience of these manufacturers and embodies the principles which have been found to be required in a satisfactory brake shoe for use upon steel tired wheels. The three important features of a successful shoe are, friction, endurance as regards length of service, and the ability to dress the tire of the wheel.

Cast iron has proved to be the best material for coach shoes as far as friction is concerned, but this material wears rapidly, and the expense of renewals

A NEW BRAKE SHOE.

on this account, is objectionable. In order to obtain the second requisite of a successful shoe, the steel inserts are made, and these are placed upon the part of the shoe which bears against the portion of the wheel which is to be worn down, namely, outside of the region of rail wear. The selection of hard crucible steel blocks was made in this case because while they lead to a certain sacrifice of holding power, they greatly increase the life of the shoe, and they do not tear the tires of the wheels as soft blocks would. The necessity of tire dressing upon coach wheels not so marked as upon locomotive drivers, yet the grooving is sufficient to require attention.

Chilled iron, unless in the form of a cutting edge, does not wear seriously upon steel tires, and this explains the presence of the four chilled spots upon the portion of the shoe which bears against the the throat of the flange. The chilled spots do not wear rapidly, and they hold up the inner edge of the brake shoe and materially add to its life. The proportion of the area of the shoe which is soft cast iron, gives the necessary friction and the combination is expected to produce better results than have been obtained from any arrangement which has been tried. This design is in effect a combination of the best features of the Lappin and the Congdon shoes. The same arrangement is made in the flanged shoe, which, with its increased area of contact, will increase the holding power, and the advantage of the flanged feature in holding the shoe in place should make this pattern even more effective than the unflanged form.

Depew and the Students.

A member of the University Club, San Francisco, recently told an excellent bit of personal reminiscence regarding Chauncey Depew's speech-making proclivities.

"I was attending Princeton College at the time," he said, "and when one day a long train drew into the station, loud cries of 'Speech! Speech!' were heard from the mouths of a hundred students.

"At once the door of a sumptuous private car flew open, and out stepped the suave and stately Depew. At once he began an oration for keeps. But as he proceeded he was deeply shocked and disgusted to find that his supposed audience didn't pay any attention to him, but still kept howling 'Speech!'

"With an impatient gesture, he ceased, and, slamming the door, sent out for the station master.

"'Are your Princeton boys always so rude?' he de-

manded, 'that they cannot listen to an address which they are shouting for!'

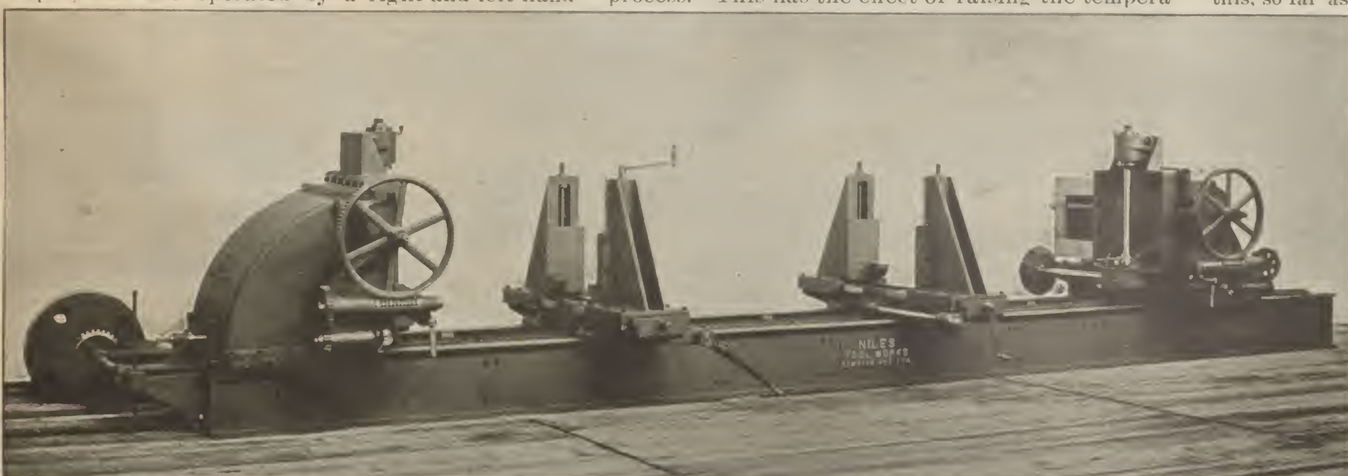
"'Oh, no, sir; they're all right. They're just saying good-bye to the old geology professor, and they were trying to get a word out of him.'

"Depew's disgust was redoubled."—News Letter.

DOUBLE-COLUMN MILLING MACHINE.

The accompanying illustration is reproduced from a photograph of a heavy double-column milling machine, designed and built by the Niles Tool Works for use in the construction of girders for bridges, buildings or structures of similar nature. The bed plate of the machine is made up of two girders strongly cross-braced. There are two heads, one stationary and the other adjustable, the rapid movements of the latter being made by means of a rack and pinion, and the accurate adjustments by means of a fine screw. The cutters stand in a vertical position, and the saddles which carry them have a cross-motion on the column of 42 in., the feed being by power or by hand, as desired. The stationary head is arranged so that it can be tilted for milling surfaces at an angle. The drive is from one end and by a cone pulley through a heavy shaft extending the length of the bed plate to the right hand column. Solid or inserted tooth cutters may be used. Both cutters operate at the same time, so both ends of a column or girder can be faced at one and the same time, and if desired one end can be leveled while the other is faced off square.

The work is clamped and held rigidly up to the cutters by two clamping carriages, each provided with two clamping jaws which are adjustable vertically to accommodate work of varying sizes and shapes, and are operated by a right and left hand


DOUBLE HEAD GIRDER MILLING MACHINE—NILES TOOL WORKS.

screw, so they are self-centering. These carriages are moved along the bed-plate by a rack and pinion for making adjustments for work of different lengths. Throughout the entire machine all bearings and bearing surfaces have been made very large in order to give the stiffness which is essential to good heavy milling machine work. This machine is built to face columns up to 26 ft. in length, but this dimension is of course arbitrary, and can easily be varied by lengthening or shortening the bed.

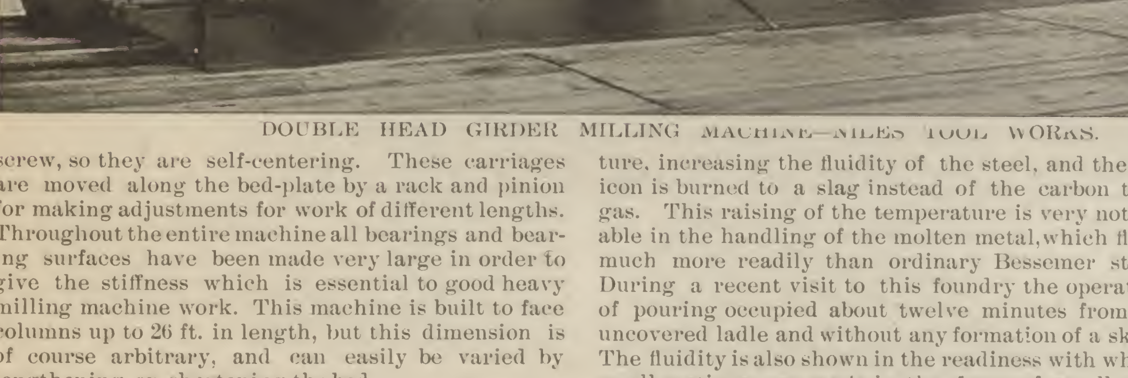
This machine is an excellent example of the manner in which the demand for special machines has developed, and is one of the many features of the great amount of steel and iron now being used in all kinds of structures, as a company must have a large amount of this class of work in order to be warranted in putting in such a machine. It was built by the Niles Tool Works of Hamilton, Ohio, and is only one of a line recently turned out for this class of work.

IRON FRAME DIMENSION PLANER.

The Daniels planer is one of the last of the old fashioned wood working machines to give way to modern improvements and although it is still in use in many shops it is too slow and leaves the work too rough and must give way to such machines as the one shown in the accompanying illustration. This machine it it is claimed will take the wind out of timber as well as the Daniels planer and there is no question but that it will leave a smoother surface and turn out a larger quantity of work.

The table of the machine runs on ways which form a part of a heavy bed plate and is propelled either by gearing or a rope as desired by the purchaser. The cylinder is of solid steel slotted on four sides, belted on each end and has journals of ample dimensions. It may be raised and lowered either by power or by hand as desired by the operator. The chucking device is simple and easily adjusted for different lengths of timber.

The machine can be fitted up with feed rolls and will then surface stock up to 4 in. in thickness. These rolls are easily thrown in and out of gear but a pressure roll on either side of the cylinder for holding the timber during the cutting is always in action. The machine is manufactured by the J. A. Fay & Egan Company of Cincinnati, O., and is made in sizes to plane 24, 28 and 30 inches in width, up to 24 in. in thickness and from 10 to 60 ft. in length. A wooden frame machine of the same design is also built when desired.


IRON FRAME DIMENSION PLANER.

THE POTTER & HOLLIS FOUNDRY COMPANY'S PROCESS.

The Potter & Hollis Foundry Company of Chicago is now operating its new process known as the Walrand-Legenisel process. This has been in use for several years in France, but it is entirely new in this country. It is a modification of the Bessemer process, having for its object the production of quiet and more fluid steel and sound castings and ingots in consequence. The high calorific power of silicon is taken advantage of in making an after blow at the point of the flame drop in the ordinary Bessemer process. This has the effect of raising the temperature, increasing the fluidity of the steel, and the silicon is burned to a slag instead of the carbon to a gas. This raising of the temperature is very noticeable in the handling of the molten metal, which flows much more readily than ordinary Bessemer steel. During a recent visit to this foundry the operation of pouring occupied about twelve minutes from an uncovered ladle and without any formation of a skull. The fluidity is also shown in the readiness with which small castings are made in the form of small gear wheels, or other castings weighing in some cases less than a pound. Much of the casting is done on the small work by means of hand ladles holding about 100 lbs., and these sometimes require twenty minutes for pouring, which is done without difficulty.

The Potter & Hollis Company has taken a portion of the foundry of the Sargent Company at Fifty-ninth and Wallace streets, Chicago, which was formerly used for the making of cast iron brake shoes, and fitted it up with the Bessemer plant for the operation of the new process. The converter has a capacity of 1,500 lbs., and is easily tipped by hand by one man.

The blast is furnished by a new blowing engine put in for the purpose, and the remarkably low pressure of 10 lbs. per sq. in. is used for the converter. The converter is of the usual type and receives the pig iron in the ordinary manner from the cupola which is near at hand. The blowing is continued until about the time of flame drop, when the vessel is turned down and ferro-silicon, containing from 10 to 12 per cent of silicon is added. An after blow is then made, after which ferro-manganese or spiegel is added to the converter for re-carbonizing, and the steel is then ready for pouring. The converter is turned down the first time just before the flame drop, so as to leave enough carbon to act as an index in the spectrum of the after blow, the spectroscope being used to control the blowing. A charge of about 1,200 lbs. is usually blown, and of this 80 per cent is pig and the rest is steel scrap, consisting of sprues, heads and scrap castings which are melted with the pig iron in the cupola. The ferro-silicon and spiegel are melted in crucibles in which they are carried to the converter.

Mr. H. L. Hollis, in a paper read recently before the American Institute of Mining Engineers, speaks as follows with regard to the product:

The steel made by this process is satisfactory in every respect. Entirely sound castings of any size, up to the capacity of the vessel, as well as ingots, are obtained, and the steel shows high physical tests. The carbon, manganese and silicon are entirely under control, the first two being regulated by the added spiegel, and the latter by the blowing; the phosphorus and sulphur depend, of course, on the stock. Successive heats can be blown with practically identical compositions. At the Chicago plant the composition for the usual run of castings is from 0.25 per cent to 0.30 per cent carbon, between 0.10 per cent and 0.20 per cent silicon and about 0.60 per cent manganese. Such steel will give, unannealed, 75,000 to 80,000 lbs. tensile strength, with 5 per cent elongation in 8 in., and 70,000 to 75,000 lbs. tensile strength, with 12 per cent elongation in 8 in. annealed. The experience so often quoted of obtaining less sound castings as a temperature of the steel rises is entirely reversed, and it is found that the hotter the steel the more solid and the most satisfactory in every way are the castings.

A word in regard to the silicon in this steel. While it is possible to run the silicon down for regular practice as low as 0.05 per cent it is found that nothing is gained by doing this, so far as castings are concerned. By increasing the silicon (even as high as 0.50 per cent) the tensile strength is raised very much without appreciably lowering the elongation. Tests for magnetic permeability have been made with this steel containing over 0.30 per cent carbon and with manganese above 1 per cent which have given the very best results. While it is not the intention of the writer to theorize, it would seem that the very high casting temperature, together with the freedom from gas, resulted in physical conditions in the steel which modified the influence of the chemical constituents, as generally formulated.

To summarize what may be justly claimed for this process up to the present time: 1, it furnishes a steel foundry with fluid, quiet steel in quantities and at such intervals as are best adapted to the work to be poured; 2, it makes possible casting successfully small and intricate pieces in steel; 3, green sand molds can be used with satisfactory results, the steel being so fluid and holding its temperature so well that it can be poured slowly over a lip, and in this way not tear a green sand mold and not carry in air, as is the case so often when bottom pouring is employed. It should be said, however, that when castings have to be machined for a perfect surface it is better to use dry sand molds, for with green sand there is an unavoidable "pinholing" at times in from the surface; 4, the relative small cost of installation, and the fact that a converter can be heated up in an hour ready for use, makes it unnecessary to operate the plant continuously to obtain economical or satisfactory results. It should be added that M. Walrand claims the same results in the basic process by substituting a high phosphorous iron for the ferro-silicon addition, but with this the writer has had no experience.

The most noticeable feature in watching the process is the fluidity and the facility with which small as well as large castings are poured. The metal is also quiet in the molds as seen in the risers. Some difficult castings were seen, such as double crank shafts for steam engines, and gear wheels, in either of which blow holes would constitute fatal defects.

CHEMISTRY FOR ENGINEERS AND MANUFACTURERS. A practical text book by Bertram Blount, F. I. C., F. C. S., consulting chemist to the crown agents for the colonies, and A. G. Bloxan, F. I. C., F. C. S., consulting chemist, head of the chemistry department, Goldsmith's Institute, New Cross. Vol. 1. Chemistry of Engineering, Building and Metallurgy. Illustrated, Cloth, octavo, 244 pages. Price, $3.50. London: Chas. Griffin & Co., Ltd. Philadelphia: J. B. Lippincott Company, 1896.

The authors have endeavored to make this a practical text book for the use of practicing engineers, managers of works and technical students. Lengthy discriptions of plant and processes are avoided and only such are described as are typical of the class to which they belong. The subjects are treated in a manner showing their relations to each other, and in this way the book is designed to be useful even to experts. The work is divided into two volumes, each complete in itself, the first of which, the book under consideration, includes the chemical principles of subjects which are of particular interest to the mechanical engineer, the architect, builder, and to all manufacturers who are concerned in the erection of plant and the production of power. The authors state in the preface that the information given is designed to be of so practical a character as to enable an owner of machinery or user of power to detect causes of bad economy and to realize when saving may be effected by calling in expert assistance. The second volume treats of the chief manufactures which have a chemical basis.

Vol. I is divided into two parts, the first of which treats of the chemistry of the chief materials of construction, the chemistry of the sources of energy, of steam raising, and

of lubricants and lubrication. Among the materials of construction, stone, brick and concrete, structural metals, roofing materials are dealt with with reference to strength, permanency and methods of preservation. The other subjects of chief interest to engineers in general lines have to do with the chemistry of the fuels, solid, liquid and gases, and forms of energy. The chemistry of steam raising deals with boiler incrustation and the method of preventing it. An interesting chapter treats of lubrication. The subject of metallurgy is handled in a concise, clear style, which enables one to find explanations of processes easily and without necessity of searching through exhaustive chapters for information of a general character.

TECHNICAL MEETINGS.

Annual convention Master Car Builders' Association, June 17, Saratoga, New York.

Freight Claim Association, May 6, Chicago, Ill.

Association Railway Claim Agents, May 27, Monongahela House, Pittsburgh, Pa.

International Association Car Accountants, June 9, Cleveland, Ohio.

Annual convention American Master Mechanics' Association, June 22, Saratoga, New York.

Association American Railway Accounting Officers, May 27, New York City.

Association Railway Telegraph Superintendents, June 17, Fortress Monroe, Va.

American Association General Baggage Agents, July 15, Philadelphia, Pa.

The American Society of Civil Engineers holds meetings on the first and third Wednesdays in each month, at 8 p.m., at the House of the Society, 127 East Twenty-third street, New York City.

The Association of Civil Engineers of Cornell University meets weekly every Friday, from October to May inclusive, at 2:30 p. m., at Lincoln Hall, New York.

The Boston Society of Civil Engineers, meets monthly on the third Wednesday in each month, at 7:30 p. m., at Wesleyan Hall, 36 Bromfield street, Boston, Mass.

The Canadian Society of Civil Engineers meets every other Thursday at 8 p. m., at 112 Mansfield street, Montreal, P. Q.

The Foundrymen's Association meets monthly on the first Wednesday of each month, at the Manufacturers' Club, Philadelphia, Pa.

The International Irrigation Congress will hold its fourth session at Albuquerque, N. M., September 16-19. Fred L. Alles, secretary, Los Angeles, Cal.; local secretary, W. C. Hadley, E. M., Albuquerque, N. M.

The Montana Society of Civil Engineers meets monthly on the third Saturday in each mouth, at 7:30 p. m., at Helena, Mont.

The New England Railroad Club meets on the second Tuesday of each month, at Wesleyan Hall, Bromfield street, Boston, Mass.

The New York Railroad Club has a monthly meeting on the third Tuesday in each month, at 8 p. m., at 12 West hirty-first street, New York City.

The Northwestern Track and Bridge Association meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m., at the St. Paul Union Station, St. Paul, Minn.

North-West Railway Club meets alternately at the West Hotel, Minneapolis, and the Ryan House, St. Paul, on the second Tuesday of each month.

The Railway Signaling Club holds its meetings in Chicago, Ill., on the second Tuesday of January, March, May, September and November. G. M. Basford, secretary, 818 The Rookery.

The Southwestern Society of Mining Engineers will hold a session at Albuquerque, N. M., September 16-19. Walter C. Hadley, secretary, Albuquerque, N. M.

The Southern & Southwestern Railway Club holds its meetings on the third Thursday of January, April, August and November, at the Kimball House, Atlanta, Ga.

The Western Railway Club of Chicago, holds its meeting on the third Tuesday of each month.

The Central Railway Club meets on the fourth Wednesday of January, March, April, September and October, at 10 a. m., at the Hotel Iroquois, Buffalo, N. Y.

The Western Foundrymen's Association holds its meetings on the third Wednesday in each month, at the Great Northern Hotel, Chicago, Ill.; secretary, S. T. Johnston, 1522 Monadnock building.

The Technical Society of the Pacific Coast has a monthly meeting on the first Friday in each month at 8 p. m., at the Academy of Sciences building, 819 Market street, San Francisco, Cal.

The Civil Engineers' Club of Cleveland, meets on the second and fourth Tuesdays in each month, at 8 p. m., at the Case Library building, Cleveland, Ohio.

The Association of Engineers of Virginia, holds its informal meetings on the third Wednesday of each month from September to May inclusive, at 8 p. m., at 710 Terry building, Roanoke, Va.

The American Society of Irrigation Engineers. Third annual meeting will be held at Albuquerque, N. M., September 16-19. John L. Titcomb, secretary, 36 Jacobson block, Denver, Col.

The Denver Society of Civil Engineers meets on the second and fourth Tuesdays in each month except July, August and December, when they are held on the second Tuesday only, at 36 Jacobson building, Denver, Colo.

The Engineers' and Architects' Club of Louisville has a monthly meeting on the second Thursday in each month, at 8 p. m., at the Norton building, Fourth avenue and Jefferson street, Louisville, Ky.

The Engineering Association of the South meets on the second Thursday of each month at 8 p. m., at the Cumberland Publishing House, Nashville, Tenn.

The Engineers' Club of Cincinnati has a monthly meeting on the third Thursday in each month, at 7:30 p. m. at the Literary Club, 24 West Fourth street, Cincinnati, O. Address P. O. Box 333.

The Engineers' Club of Minneapolis holds its meetings on the first Thursday in each month, at Public Library building, Minneapolis, Minn.

The Engineers' Club of Philadelphia meets on the first and third Saturdays in each month, at 8 p. m., at the house of the club, 1122 Girard street, Philadelphia, Pa.

The Engineers' Club of St. Louis meets on the first and third Wednesdays of each month, at the Missouri Historical Society building, Sixteenth street and Lucas place, St. Louis. Mo.

The Engineers' Society of Western Pennsylvania holds its monthly meeting on the third Tuesday of each month 7:30 p. m. at the Carnegie Library Building, Allegheny Pa.

PERSONAL.

Mr. P. L. Fisher has been appointed auditor of material and labor accounts on the Chicago & Northwestern, vice Mr. L. C. Jones, resigned.

Mr. W. R. Blair, of Pittsburg has been appointed special master in the receivership of Thos. M. King, of the Pittsburgh & Western road.

Mr. T. I. Wasson, of Marshalltown, Iowa, has been appointed general auditor of the Iowa Central Railroad, to succeed Mr. Norman Cableman, recently deceased.

Mr. H. A. Laing, late contracting agent of the Baltimore & Ohio at Chicago, has been appointed commercial agent of the same road with headquarters at Kansas City.

Mr. Joseph Crawford, formerly superintendent of the New York division of the Pennsylvania lines, has been appointed general agent of the company at Washington.

Mr. P. E. Hansen, one of the old employes of the Louisville & Nashville road and for the past few years train dispatcher for that company at Mobile, died last week at his home in Mobile.

Mr. George Mason has been appointed engineer of maintenance of way of the Grand Trunk's western division, with headquarters at Detroit. He was formerly with the Grand Haven & Milwaukee.

Mr. W. G. McEdwards is acting as chief clerk of the passenger department of the Erie lines at Chicago in place of Mr. I. Chesbrough, resigned. The regular appointment to fill the position will be made on Saturday, 25th.

Mr. F. S. Davis has been appointed general western freight agent of the Fitchburg road, vice Mr. C. E. Wolfe, resigned, and Mr. Edward Shattuck, Jr., is to succeed Mr. Davis as east-bound freight agent, with office in Boston.

Mr. Robert E. Parsons has been appointed district passenger agent of the Chesapeake & Ohio at Louisville, and is to have jurisdiction over all the ticket and passenger agents in all of what is called the Louisville territory.

Mr. J. A. McDuffy has been appointed eastern agent of the Georgia & Alabama Railroad, with headquarters in New York. Mr. J. W. Walker has been made southwestern agent of the same company, with headquarters in New Orleans.

Mr. Ben Vail, for ten years chief clerk of the Ann Arbor passenger department, has been appointed rate and ticket clerk in the general passenger department of the Ohio Central. He succeeds S. G. Havey who now has the position of traveling passenger agent.

It is understood that the position of traveling passenger agent of the Cincinnati, Hamilton & Dayton recently made vacant by the resignation of Mr. McDonough, will be filled by Mr. W. J. Nichols, with headquarters at Indianapolis, Ind.

Mr. James Stephenson, late general superintendent of the Grand Trunk road has been presented with a purse of $2,000, by the employes of that road. Mr. Stephenson has held the position for many years and was highly esteemed by all employes of the lines.

Mr. Dudley Walker has been appointed as district passenger agent of the Chicago & Alton, with headquarters at Chicago. He is to have charge of all advertising arrangements of the company, and Mr. R. M. Wildman succeeds him as traveling passenger agent.

Judge Joseph H. Blair has been appointed attorney for the receivers of the Union Pacific Railway Co. for the state of Idaho, with headquarters at Pocatello. Judge Blair was formerly a judge of the district court his term having expired in January of this year.

It is reported that Major Samuel Killebrew, who is now locating engineer for the Mexican International Railroad, has been appointed chief engineer of the Guatemala Central Railroad, and will leave at once to assume his new duties, with headquarters at Guatemala City.

Mr. John G. Lindsey, commercial agent, and Mr. Aubrey Maguire, traveling freight agent of the Missouri, Kansas & Texas road have received notice that their services would no longer be required after June 1. It is said that the curtailment of expenses has made this necessary.

Mr. F. W. Morse, for seven years master mechanic of the eastern division of the Wabash, with headquarters in Fort Wayne, has resigned to accept the office of superintendent of motive power of the entire Grand Trunk system, succeeding Mr. H. H. Wallis, with headquarters at Montreal, Can.

Mr. F. P. Olcott has been elected president and a director of the Galveston, Houston & Henderson Railroad. This choice is said to be in accordance with an agreement dating back several months, by which the Missouri, Kansas & Texas and the International & Great Northern entered into joint use of the Galveston, Houston & Henderson.

Mr. S. M. Shuttuc, city passenger agent of the Baltimore & Ohio Southwestern at St. Louis, has been appointed traveling passenger agent of the same road with headquarters at Denver, Col. The Denver office of the company was closed some time ago, but it is to be reopened. Mr. Shattuc has many friends who will be glad to hear of his promotion.

Mr. Ray Knight, formerly division freignt agent of the Southern Railway Co. with headquarters in Selma, Ala., has been employed as freight agent and traffic manager by three of Anniston's big industries, the Anniston Pipe & Foundry Co., the Hercules Pipe & Foundry Co., and the Anniston Iron & Steel Co. His headquarters will be at office of the Anniston Pipe & Foundry Co., at Anniston, Ala.

Mr. L. L. Lincoln, general superintendent of the Portland & Rumford Falls Railroad, has tendered his resignation owing to advancing age and declining health, but it is understood that the company is endeavoring to get him to retain the office, and that his resignation has not yet been accepted. He is one of the best known railroad men in the state of Maine and has been in the employ of the Rumford Falls road about 12 years.

Mr. K. S. Stoner, engineer of maintenance of way of Mississippi River & Bonne Terre road, having resigned, that office is abolished. Mr. A. B. McKinley is appointed acting roadmaster, with headquarters at Bonne Terre, Mo., in charge of track work, reporting to the general superintendent. Mr. E. L. Cary will continue as foreman of bridges and buildings, with headquarters at Bonne Terre, Mo., reporting to the general superintendent.

Mr. S. T. Earley has been appointed roadmaster of the territory lying between Paducah and Lexington on the Memphis & Paducah division of the Nashville, Chattanooga & St. Louis Railway, with headquarters at Paris, Tenn. Mr. Earley will have charge of all track forces and all work and gravel trains. Mr. R. B. Clover is appointed general bridge foreman of the same division. Mr. Clover will have direct charge of all the employes in the bridge department.

The appoinment of Mr. W. Frank Schaff as yardmaster of the Big Four Railroad at Louisville, has been announced. Mr. Schaff was formerly clerk to S. A. Stack, general yardmaster of the Big Four at Columbus, having served about six months in this position. Mr. Schaff, who is a brother of Mr. Charles Schaff, general manager of this system, is only 22 years old, and as the terminals at Louisville have only recently been opened, his new position will be a responsible one.

Mr. William Tunkey, the Lake Shore & Michigan Southern engineer who made the fast run last October, has been presented with a gold watch by the Brooks Locomotive Works. The outside of the case has upon it a fine hand engraving of the "Record Breaker No. 564," and on the inside is engraved the following: "Presented by the Brooks Locomotive Works to William Tunkey, who broke all previous speed records Oct. 24, 1895, with Brooks 10-wheel engine No. 564, between Erie and Buffalo. Average speed 72.92 miles an hour. Maximum speed 92.3 miles and hour."

Mr. John M. Egan, one of the best known railroad men in this country, has been appointed assistant president of the Lake Superior & Ishpeming Railway, appointment taking effect at once. Mr. Egan has lately been president of the Chicago Great Western Railway, and has occupied positions as general superintendent of the Great Northern Railway, and the same office on the western division of the Canadian Pacific. His appointment on the new road is construed by some as conclusive evidence that the connection with the Chicago, Milwaukee & St. Paul will be effected as quickly as connecting links of road can be built.

Mr. Frank H. Alfreds has been appointed roadmaster of the Cleveland, Akron & Columbus, to succeed John Roach, who resigned several weeks ago. Mr. Alfreds' first work was on the old Lancaster & Hamden road, after which he assisted in the building of the Norfolk & Western terminals at Columbus, and then took a course in civil engineering at the Ohio State University. He was later appointed chief clerk in the office of Chief Engineer Sheldon, of the Hocking Valley, and in this position he served from June, 1894, until January, 1895, when he was appointed assistant engineer of the Denver & Rio Grande. He was on a leave of absence from this latter position when he was made roadmaster of the Cleveland, Akron & Columbus by Acting General Superintendent Sample.

Mr. C. E. Winterringer has been appointed city passenger and ticket agent of the Columbus, Sandusky & Hocking, at Columbus, by General Passenger Agent Akin, the appointment to take effect May 1. Mr. Winterringer has been connected with the Cleveland, Akron & Columbus for twelve years, eight of which he has been as city ticket agent at Columbus. He received his appointment on the Cleveland, Akron & Columbus at the hands of Mr. Akin when the latter gentleman was the district passenger agent of that road, and Mr. Winterringer's appointment to take charge of the new ticket office to be established by the Columbus, Sandusky & Hocking will be good news to his many friends.

Mr. C. H. Jenks, superintendent of the northern division of the Great Northern Railway system, has been promoted to the position of general superintendent of the Montana Central, with headquarters at Great Falls. Mr. Jenks' administration of the Northern division has been eminently satisfactory, and as this new appointment is in the nature of a promotion it is a well deserved and merited recognition of faithful service to the company. Superintendent Jenks has been in the service of the Great Northern Railway Company for the past 26 years, and has engaged in no other business or occupation. His whole time has been devoted exclusively to the interests of the Great Northern. His retention by the company for so many years is an evidence of the full appreciation of the company of past faithful service.

General Traffic Manager Taro Adachi, Superintendent T. Hiracoa, and Chief Engineer S. Mimura, of the Nippon Tetsudo Kwaisha, the Imperial Japan Railway Co. arrived in Seattle a week ago from their native land, on a tour round the world to see what they can learn that will be of use to them in advancing the science of railroading in Japan. They are part of a company of 18 experts of various kinds who started together from Japan on an experience trip to the civilized countries of the earth. Four of the party were professors from the Imperial College at Tokio, another was C. Asahini, the editor of the Tokio Nichi, the largest daily newspaper in Japan, and the others were specialists of several sorts. The party will travel together as far as possible, but of necessity will separate at times as the lines of research may happen to lie in different cities. All three of the first named men speak English, of course, and, from all accounts of their doings in Seattle, they are hard workers and will accumulate a vast amount of miscellaneous information about railroads before they leave this country.